ESTD :1960

Phone : (02774) 246410

ધી મ. લા. ગાંધી ઉચ્ચતર કેળવણી મંડળ, મોડાસા સંચાલિત

સર પી. ટી. સાયન્સ કૉલેજ, મોડાસા

હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ સંલગ્ન

The M.L.Gandhi Higher Education Society, Modasa Managed

Sir P. T. Science College, Modasa

Affiliated to Hemchandracharya North Gujarat University, Patan

Accredited by B++ by NAAC & A Grade by KCG, GOG

પો.બો.નં.૦૧, કોલેજ કેમ્પસ, મોડાસા-૩૮૩ ૩૧૫, જિ. અરવલ્લી (ગુજરાત)

P.B. No. 01, College Campus, MODASA-383 315, Dist-Arvalli (Gujarat)

Website : www.sirptsciencecollege.org
E-mail: sirptscience127@gmail.com

College Code No. : 32 / HNGU Code : 008
AISHE Code : C-6635

Grant Code No. : 127
Zone Code No. : 93

Ref. No. Date : / /20

Syllabus of various Courses

Sir P T Science College, Modasa

Affiliated to Hemchandracharya North Gujarat University, Patan

Syllabus of various Courses as Follow

- NEP2020: B Sc→ Chemistry, Botany, Mathematics, Physics, Microbiology
- B Sc:→ Chemistry, Botany, Mathematics, Physics, Microbiology
- M Sc:→ Chemistry, Botany, Physics.
- Ph D :→ visit on https://ngu.ac.in/Phd.aspx

For updated information visit on → https://ngu.ac.in/Syllabus.aspx

Date: 09-04-2024

SIR P. T. SCIENCE COLLEGE 32 127 MODASA

Principal
Sir P. T. Science College
Modasa-383315,Dist.Arvalli.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN	
M.Sc. (Physics) CBCS Syllabus 2019	
Document code	SYLLABUS MSPHY2019
Revision No.	00
Name of Faculty	SCIENCE
Faculty Code	SC
Program Name	MASTER OF SCIENCE (PHYSICS)
Program Code	MSPHY
Effective from	June 2019

PROGRAM : HNGU 2057

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

The proposed New Course in **M.Sc. PHYSI CSPROGRAM** is based on Choice Based Credit System (CBCS) which is in force from June-2019.

CBCS Course Pattern

1. This Program is divided into **four Se mesters** (Two Years). The duration of an academic year consists of two semesters, each of **15** weeks for teaching. The academic session in each semester will provide **90** teaching days. 24 credit each semester X 4 semester=96 credits at master level.
2. There will be three categories of courses/papers in this Program:
   - **A.** **FOUR** Compulsory-Core theory courses with 4 credits each in first three semesters and Three Compulsory-Core theory courses with 4 credits each **I nSe mesterIV.**
   - **B.** **One** Choice Based Elective Course (disciplinary/interdisciplinary) with 2 credits in First Three semesters.
   - **C.** **One** Practical course (PR) with 6 credits in first three semesters.
   - **D.** **In Semester IV**, instead of practical there is a project/field work with 12 - credits.
3. Detailed Course Pattern for each Semester is given bellow.

The Proposed New Structure for M.Sc. Course is based on choice Based Credit System (CBCS) which is in force from June – 2019

M.Sc.: Semester – I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – I	Core-I	2 : 30	70	30	100	4	4
Paper – II	Core-II	2 : 30	70	30	100	4	4
Paper – III	Core-III	2 : 30	70	30	100	4	4
Paper – IV	Core-IV	2 : 30	70	30	100	4	4
Practical : Paper – I	Pract-I	3	75	--	75	6	3
Practical : Paper – II	Pract-II	3	75	--	75	6	3
Elective Course (Any One) Disciplinary/ Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Se mester –I I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – V	Core-V	2 : 30	70	30	100	4	4
Paper – VI	Core-VI	2 : 30	70	30	100	4	4
Paper – VII	Core-VII	2 : 30	70	30	100	4	4
Paper – VIII	Core-VIII	2 : 30	70	30	100	4	4
Practical : Paper – III	Pract-III	3	75	--	75	6	3
Practical : Paper – IV	Pract-IV	3	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – IX	Core-IX	2 : 30	70	30	100	4	4
Paper – X	Core-X	2 : 30	70	30	100	4	4
Paper –XI	Core-XI	2 : 30	70	30	100	4	4
Paper – XII	Pract-XII	2 : 30	70	30	100	4	4
Practical : Paper – V	Pract-V	3	75	--	75	6	3
Practical : Paper –VI	Pract-VI	3	75	–	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Semester – IV

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – XIII	Core-X	2 : 30	70	30	100	4	4
Paper – IX	Core-XI	2 : 30	70	30	100	4	4
Paper – XV	Core-XII	2 : 30	70	30	100	4	4
Project	PROJECT	4	210	90	300	18	12
TOTAL			420	180	600	30	24

NOTE:

1. For 4 credit course: Each syllabus is of 4 Units having equal weightage.
2. For 2 credit course: Each syllabus is of 2 Units having equal weightage.
3. There is no section in semester end examinations i.e. questions Paper is without sections.
4. For question paper of 70 marks: Each Question paper contains 4 questions: Q-1 from unit-I of 18 marks, Q-2 from unit-II of 17 marks, Q-3 from unit-III of 18 marks and Q-4 from unit – IV of 17 marks.
5. For question paper of 35 marks: Each Question paper contains 3 questions: Q-1 from unit-I of 12 marks, Q-2 from unit-II of 12 marks, and last Q-3 is of short questions and objective types having **11 marks from unit I and unit II.**

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
1	MSPHY101CC	CC	MATHEMATICAL PHYSICS-1AND"C" PROGRAMMING-1	70		30		4	100	
1	MSPHY102CC	CC	CLASSICAL MECHANICS -1 AND ELECTRODYNAMICS-1	70		30		4	100	
1	MSPHY103CC	CC	QUANTUM MECHANICS-1 AND SOLID STATE PHYSICS-1	70		30		4	100	
1	MSPHY104CC	CC	ELECTRONICS-1	70		30		4	100	
1		PRACT			150			6	150	
1	MSPHY101ES	ES	SPACE PHYSICS	35		15		2	50	Any one from Two ES PAPER
1	MSPHY102ES	ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS (ETS)	35		15		2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
2	MSPHY201ES	CC	MATHEMATICAL PHYSICS-2 AND "C" PROGRAMMING-2	70		30		4	100	
2	MSPHY202CC	CC	STATISTICAL MECHANICS-1 COMPUTOR-1	70		30		4	100	
2	MSPHY203CC	CC	QUANTUM MECHANICS-2 AND SOLID STATE PHYSICS-2	70		30		4	100	
2	MSPHY204CC	CC	ELECTRONICS-2	70		30		4	100	
2		PRACT			150			6		
2	MSPHY201ES	ES	APPLICATION OF COMPUTOR IN PHYSICS	35		15		2	50	Any one from Two ES PAPER
2	MSPHY201ES	ES	SYNTHESIS OF MATERIALS	35		15		2	50	

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
3	MSPHY301CC	CC	NUCLEAR PHYSICS-1 INSTRUMENTS	70		30		4	100	
3	MSPHY302CC	CC	STATISTICAL MECHANICS-2 COMPUTOR-2	70		30		4	100	
3	MSPHY303CC	CC	QUANTUM MECHANICS-3 SOLID STATE PHYSICS-3,	70		30		4	100	
3	MSPHY304CC	CC	ELECTRONICS-3	70		30		4	100	
3		PRACT			150			6	150	
3	MSPHY301ES	ES	RESEARCH METHODOLOGY	35		15		2	50	Any one from Two ES PAPER
3	MSPHY301 ES	ES	MICROCONTROLLER	35		15		2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
4	MSPHY401CC	CC	NUCLEAR PHYSICS-2 BIO-PHYSICS	70		30		4	100	
4	MSPHY402CC	CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS-2	70		30		4	100	
4	MSPHY403CC	CC	QUANTUM MECHANICS-4 SOLID STATE PHYSICS-4,	70		30		4	100	
4		PR		210		90	-	12	300	

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PATTERN/SCHEME OF EXAMINATION

There will be examinations at the end of each semester ordinarily during November / December for odd semesters and during April/May for even semesters.

Theory Examinations:

Out of the total marks for each course/paper maximum 30% marks shall be earmarked for Internal Exam.(Through continuous internal evaluation process) and remaining 70% for External Exam. (Through semester-end examinations).

There will be one semester-end examination of two hours and thirty minutes duration for core theory papers and two hours for elective papers. Each answer script of semester end examination (theory) will be evaluated by internal as well as external examiner.

The passing marks in each paper shall be **40%.**

PRACTICAL EXAMINATION:

In the case of science faculty, there will be a practical examination at the end of every semester. There will be **TWO** Practical (one from each groups) (75Marks each for Sem.-I to Sem.-III) in the Exam. The passing marks for practical will be **40%. The practical examinations shall be conducted with one internal and one external examiner.**

In 4th Semester one minor project work there will be of 300 marks. Assessment method is given bellow.

Project Report (70 Marks): Aims & Objectives-Clearly stated and achieved? Layout, Writing style, quality of Figures, Tables, Proper organization of work etc.Use of Lib./Int./Ref.: Literature review, survey, referencing etc

Presentation (70 Marks): Way of presentation, quality of presentation, Language, clarity of speech, Method of analysis, conclusion and Recommendations, Discussion of work etc.

Viva-Voce (70 Marks): ability to answer quarries and question.

There will be no internal assessment test for practical, and Elective coursesin first three semester but in fourth semester there will be internal assessment for Project work .

INTERNAL ASSESSMENT

For each paper/course in a semester there will be Continuous internal evaluation process which includes

- Unit Test / Internal Test
- MCQ Test / QUIZ Test/Viva
- Seminar/ Poster Presentation/ Assignment work/Workshop
- Attendance - Regularity & Study Tour
- Library work -Book Review

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STRUCTURE OF THE PAPER IN EXAMINATION

For Core Courses (Disciplinary/Interdisciplinary):

There will be total four questions. First question will be from Unit - I, Second question from Unit-II, Third question from Unit-III, and fourth question will be from Unit -4. All the questions are detailed as under. **(Total 70 Marks and 2 Hours thirty minutes time for the Paper)**

1	(a) Answer the following. (Any one out of two) (Theory questions)	8 Marks
1	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
1	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
2	(a) Answer the following. (Any one out of two) (Theory questions)	7 Marks
2	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
2	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
3	(a) Answer the following. (Any one out of two) (Theory questions)	8 Marks
3	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
3	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
4	(a) Answer the following. (Any one out of two) (Theory questions)	7 Marks
4	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
4	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks

For Elective Courses (Disciplinary/Interdisciplinary):

There will be three questions first and second questions are of 12 marks each and third question is of 11marks. First question will be from Unit - I, Second question from Unit-II, Third question will be from both Units. All the questions are detailed as under. **(Total 35 Marks and 2 Hours' time for the Paper)**

1	(a) Answer the following (Any one out of two) (Theory questions)	6 Marks
	(b) Answer the following (Any two out of three) (short note/ application/ Problem/ example type)	6 Marks
2	(a) Answer the following (Any one out of two) (Theory questions)	6 Marks
	(b) Answer the following (Anytwo out of three) (short note/ application/ Problem/ example type)	6 Marks
3	(a) Answer any three out of five.(Short question) (b) Answer any five out of eight.(objective)	6 Marks 5 Marks

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DETAILED CURRICULMSUMMARY IS GIVENIN FOLLOWING TABLE.

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
I	MSPHY-101CC	MATHEMATICAL PHYSICS -1 AND PROGRAMMING IN C-1	I	FUNCTION OF A COMPLEX VARIABLE
			II	INTEGRAL TRANSFORMS
			III	DECISION MAKING AND LOOPING & ARRAYS
			IV	CHARACTER ARRAYS AND STRINGS &FUNCTIONS
I	MSPHY-102CC	CLASSICAL MECHANICS-1 ELECTRODYNEMICS -1	I	CANONICAL TRANSFORMATION
			II	SMALL OSCILLATION AND ROTATING FRAME
			III	ELECTOMAGNETIC WAVES
			IV	POYNTING VECTOR AND THE FLOW OF POWER&GUIDED WAVES:
I	MSPHY-103CC	QUANTUM MECHANICS – ISOLID STATE PHYSICS-I	I	REPRESENTATION OF QUANTUM STATES
			II	ANGULAR MOMENTUM
			III	ENERGY BANDS
			IV	SEMICONDUCTOR CRYSTALS
I	MSPHY-104CC	ELECTRONICS-1	I	FETAMPLIFIER&MULTIVIBRATORS
			II	POWER AMPLIFIER
			III	WAVE SHAPING CIRCUIT
			IV	IC FABRICATION & TIMER 555 IC
I	MSPHY-101ES	SPACE PHYSICS	I	BASIC CONCEPTS OF EARTH'S ATMOSPHERE AND IONOSPHERE
			II	AURORA , AIRGLOW, AND MAGNETOSPHERE
I	MSPHY-102ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS	I	ENERGY TECHNOLOGY
			II	ENERGY STORAGE SYSTEMS

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
II	MSPHY-201CC	MATHEMATICAL PHYSICS -2 AND PROGRAMMING IN C-2	I	TENSOR ANALYSIS
			II	GROUP THEORY
			III	STRUCTURES AND UNIONS & POINTER
			IV	FILE MANAGEMENT IN C:&DEVELOPING A C PROGRAM
II	MSPHY-202CC	STATISTICAL MECHANICS-1 COMPUTER-1	I	BASIC CONCEPT IN STATISTICAL MECHANICS AND QUANTUM STATISTICS
			II	IDEAL BOSE AND FERMI SYSTEM
			III	WINDOWS AND POWER POINT
			IV	MICRO-SOFT WORD
II	MSPHY-203CC	QUANTUM MECHANICS–2 SOLID STATE PHYSICS-2	I	APPROXIMATION METHODS FOR STATIONARY STATES:
			II	EVOLUTION WITH TIME
			III	FERMI SURFACES AND METALS
			IV	DIAMAGNETISM AND PARAMAGNETISM
II	MSPHY-204CC	ELECTRONICS-2	I	OPERATIONAL AMPLIFIER
			II	DIGITAL ELECTRONICS
			III	MICROPROCESSOR – I
			IV	MICROPROCESSOR –II
II	MSPHY-201ES	APPLICATIONS OF COMPUTER IN PHYSICS	I	
			II	
II	MSPHY-202ES	SYNTHESIS OF MATERIAL	I	
			II	

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SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
III	MSPHY-301CC	NUCLEAR PHYSICS-1 AND INSTRUMENTS	I	TWO BODY FORCES
			II	NUCLEAR REACTION
			III	MICROSCOPY
			IV	UV-VIS
III	MSPHY-302CC	STATISTICAL MECHANICS-2 COMPUTER-2	I	PHASE EQUILIBRIA
			II	TRANSPORT PHENOMENA
			III	MICRO-SOFT EXCEL
			IV	COMPUTER NETWORK,INTERNET AND VIRUS
III	MSPHY-303CC	QUANTUM MECHANICS–3 SOLID STATE PHYSICS-3	I	SCATTERING THEORY
			II	PARTIAL WAVE ANALYSIS
			III	FERROMAGNETISM AND ANTI FERROMAGNETISM
			IV	MAGNETIC RESONANCE
III	MSPHY-304CC	ELECTRONICS	I	PULSE MODULATION AND DIGITAL COMMUNICATION
			II	DEMODULATION
			III	REMOTE SENSING
			IV	POWER ELECTRONICS
III	MSPHY-301ES	RESEARCH METHODOLOGY	I	
			II	
III	MSPHY-302ES	MICROCONTROLLER	I	
			II	

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
IV	MSPHY-401CC	NUCLEAR PHYSICS-2 AND BIO-PHYSICS	I	NUCLEAR MODEL
			II	ELEMENTARY PARTICLE
			III	SEPARATION TECHNIQUES
			IV	BIO-MECHANICS
IV	MSPHY-402CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS -2	I	NON LINEAR OSCILLATIONS AND CHAOS
			II	RELATIVISTIC ELECTRODYNAMICS
			III	WAVE GUIDE
			IV	RADIATION
IV	MSPHY-403CC	QUANTUM MECHANICS–4 SOLID STATE PHYSICS-4	I	RELATIVISTIC WAVE EQATIONS-1
			II	RELATIVISTIC WAVE EQATIONS-2
			III	OPTICAL PROCESSES AND EXCITONS
			IV	SOLAR CELL AND OPTO ELECTRONIC DEVICES
IV		PROJECT		

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PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 101 CC	SEMESTER		1
MATHEMATICAL PHYSICS -1 AND PROGRAMMING IN C-1				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT – I:

FUNCTION OF A COMPLEX VARIABLE:

Introduction, Analytic functions, Contour Integrals, Laurent series, Residue Theorem, Methods of Finding Residues, Evaluation of Definite Integrals by use of the Residue theorem, the point of Infinity, residue at infinity, Mapping, Some Applications of conformal mapping.

UNIT – II:

INTEGRAL TRANSFORMS:

Introduction, Laplace Transforms, Solution of Differential Equation by Laplace Transforms, Fourier Transforms, Convolution: Parseval's Theorem, Inverse Laplace Transform (Bromwich Integral), the Dirac delta function, Green functions, Integral transform solutions of partial differential equations.

UNIT – III:

DECISION MAKING AND LOOPING:

Introduction, while statement, do statement, do while, for statement, jumps in loops – continue and break statements.

ARRAYS:

Introduction, One dimensional arrays, declaration and initialization of arrays one dimensional arrays, two dimensional arrays, initialization of two dimensional arrays, multidimensional arrays.

UNIT- IV

CHARACTER ARRAYS AND STRINGS :

Declaring and initializing string variables, reading and writing strings, arithmetic operations on characters, Putting Strings together, comparison of two Strings, String handling functions, Table of strings, other features of strings.

FUNCTIONS:

Need for user defined functions, A multifunction program, Elements of user defined functions, Definition of functions, return values and their types, Function Calls, Function Declaration, category of functions,No argument and no return values, Arguments but no return values, Arguments with return values, No arguments but returns avalue,Functions that returns multiple values, nesting of functions, recursion.

REFERENCE BOOKS:

1. Mathematical methods in the physical sciences, M.L Boas., JohnWilley, 1966
2. Mathematical Physics, P. K. Chattopadhyaya, Wiley Eastern Ltd.
3. Mathematical methods for Physicists, G. Arfken, Academic Press, 1970
4. Mathematical Physics, S. Satyaprakash, Sultan Chand & Sons, 1990
5. Mathematical Physics, By H.K.DAS
6. Programming in ANSI C (IIInd Ed.), Programming in ANSI C (IIInd Ed.), TMH Pub.
7. C Programming language, Kernighan B.W. and Ritchie D.K. PHI Pub
8. Programming in C, Kochan S.G. CBS Pub.
9. Programming with C, By B.S. Gottfried
10. Programming in C, P. Day and M.Ghosh, Oxford Univ. Press, 2007

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 102 CC	SEMESTER		1
CLASSICAL MECHANICS-1 AND ELECTRODYNEMICS -1				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT - I

CANONICAL TRANSFORMATION :

Gauge transformations, Canonical transformation, Condition for transformation to be canonical, Illustration of canonical transformations, Poisson brackets, canonical equations in terms of Poisson brackets notation, Infinitesimal transformation, Relation between Infinitesimal transformation and Poisson brackets, The Hamilton Jacobi equations, separation of variables.

UNIT – II

SMALL OSCILLATION AND ROTATING FRAME:

Stable and unstable equilibriums, Small Oscillation in a system with one degree of freedom, Small Oscillation in a system with more than one degree of freedom, Normal coordinates and Normal frequencies of vibration.

Rotating Frame, Euler angles, Inertia tensor, Euler's equations of motion of a rigid body, Free motion of a rigid body, Motion of a symmetric top.

UNIT-III

ELECTOMAGNETIC WAVES:

Conductor and Dielectrics, Polarization, Reflection by a perfect conductor -normal incidence , Reflection by a perfect conductor -oblique incidence , Reflection by a perfect Dielectric -normal incidence , Reflection by a perfect Dielectric conductor -oblique incidence , surface impedance,

UNIT-IV

POYNTING VECTOR AND THE FLOW OF POWER:

Poynting theorem, Interpretation of Poynting vector, Instantaneous, average and complex Poynting vector, Power loss in plane conductor

GUIDED WAVES:

Waves between parallel planes, transverse electric waves (E_z=0), Transverse Magnetic wave (B_z=0), Characteristics of TE and TM waves. Transverse electromagnetic waves, Velocity of Propagation, Attenuation in Parallel plane guides, Wave impedance, Electric field and current flow within a conductor.

REFERENCE BOOKS:

1. Classical mechanics-A Text Book by Suresh Chandra, Narosa Publishing House New Delhi.
2. Classical Mechanics (2nd Edition), Herbert Goldstein, Addison - Wesley Publishing Co.
3. Classical Mechanics, V. B. Bhatia, Narosa Publishing house.
4. Classical Mechanics, G. Aruldhas PHI Pvt. Ltd.
5. Classical Mechanics, J. C. Upadhyaya Himalaya Publishing House.
6. Electromagnetics (2nd Edition), B. B. Laud, Wiley Eastern,
7. Electromagnetic waves and radiating systems, E. C. Jordan and K. G. Balmani Prentice Hall of India, New Delhi, 2008

8. Handbook of Electronics by Kumar and Gupta PragatiPrakashan
9. Introduction to Electrodynamics (2nd & 3rd Edition) J. Griffiths, Prentice Hall India Ltd.
10. Antennas and Radio wave propagation, R. E. Collins, McGraw Hill Book Company, 1987
11. Electronic Communication, D. Roddy and J. Coolen, Prentice Hall, 4th edition, 1995
12. Microwave Engineering, David M. Pozar, (Third Edition), Wiley- India.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 103 CC	SEMESTER		1
QUANTUM MECHANICS –I SOLID STATE PHYSICS-I				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT – I

The equations of motion, The Schrödinger picture, The Heisenberg picture, The Interaction picture. [(4.1)QM by V K Thankappan]

Some exactly soluble Three-dimensional problem:

Anisotropic oscillator, The isotropic oscillator, Normal modes of a coupled system of particles.

REPRESENTATION OF QUANTUM STATES

Quantum states, State vectors and wave functions, The Hilbert space of state vectors; Dirac notation. Dynamical variables and linear operators. Representations. Dynamical variables as matrix operators. Product of operators Self-adjointness and Hermiticity, diagonalization, Continuous basis, The Schrödinger representation. Degeneracy-Labeling by commuting observables. Change of Basis,-unitary transformations, unitary transformations induced by change of co-ordinate system: Translations. Unitary transformation induced by rotation of coordinate system, Algebra of rotation generators, Transformation of Dynamical variables, symmetries and conservation laws.

UNIT - II

ANGULAR MOMENTUM :

Quantum theory of angular momentum and its eigenvalue spectrum. Matrix representation of angular momentum operators, spin angular momentum, Pauli matrices and their properties, total wave function, non-relativistic Hamiltonian including spin. Addition of angular momenta, definition of Clebsch-Gordan coefficients, Phase convention, spin-wave function for a system of two spin-1/2 particles, Identical particles with spin, addition of spin and orbital angular momenta.

UNIT-III

ENERGY BANDS

Nearly Free Electron Model, Origin of the Energy gap, Magnitude of the Energy Gap, Bloch Functions, Kronig- Penney Model, Wave Education Of Electron in a Periodic Potential, Restatement of the Bloch Theorem, Crystal Momentum of an Electron, Solution Of the Central Equation, Kronig- Penney Model in Reciprocal Space, Empty Lattice Approximation, Approximation Solution Near a Zone Boundary, Number of Orbitals in a Band, Metals and Insulators

UNIT-IV

SEMICONDUCTOR CRYSTALS:

Band Gap, Equations of Motion, Physical derivation of $\hbar\dot{k} = F$, Holes, Effective Mass, Physical Interpretation of the Effective Mass, Effective Masses in semiconductors, Silicon and Germanium Intrinsic Carrier Concentration, Intrinsic Mobility, Impurity conductivity, Donor States, Acceptor States, Thermal Ionization of Donors and Acceptors, Thermoelectric Effect, Semimetals, Super lattices, Bloch Oscillator, Zener Tunneling.

REFERENCE BOOKS :

1. A textbook of quantum mechanics P M Mathews and K V Venkatesan McGrawhill Education
2. Quantum Mechanics by L. I. Schiff, McGraw-Hill International student edition (1961).

3. Introduction to Quantum Mechanics by Powell and Crasemann Addison-Wesley (1961).
4. Quantum Mechanics by V.K. Thankappen, Wiely eastern Ltd.
5. Quantum Mechanics : Theory and applications by A. Ghatak and S. Lokanathan.
6. Introduction to Solid State Physics. Charles Kittel 7th Edition.
7. Introduction to Solid State Physics. J P Srivastava 4th Edition.

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PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 104 CC	SEMESTER		1
ELECTRONICS-1				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT- I

FET AMPLIFIERS:

FET parameters, biasing the FET , basic FET amplifier, FET small signal, common source a. c. amplifier, The common drain or source follower, common gateamplifier, general treatment of low frequency common source and common drainamplifier common source amplifier at high frequency, common drain amplifier at high frequencies, MOSFET: Depletion MOSFET, Enhancement MOSFET, Differences between JFET and MOSFET, Handling precaution for MOSFET

Multivibrators:

Switching Characteristics of transistor, Multivibrators, AstableMultivibrator, Monostable Multivibrator, Bi-stable Multivibrator.

UNIT-II

POWER AMPLIFIER:

Introduction, Difference between Voltage and Power amplifiers, Performance quantities of power amplifiers, Class-A power amplifier, and power distribution, Transformer coupled class –A amplifier, Power consideration and dissipation, Class-B power amplifier, Class-A Push-Pull power amplifier, Class-B Push-Pull amplifier, Tuned amplifiers, Single tuned inductively coupled transistor amplifier, Double tuned transistor amplifier.

UNIT-III

WAVE SHAPING CIRCUIT:

linear wave shaping, the high pass RC circuit, High pass RC circuit as differentiator, the Low pass RC circuit, Low pass circuit as an integrator, Non Linear wave shaping, PN junction diode switching times, Diode clipper circuits, comparison of shunt and series diode clippers, Double ended PN junction clippers, Double ended clippers using Zener diodes,

Clamping circuits: Zero Level Clamping circuits, Clamping at a given reference D.C. voltage, Design consideration of clamping circuit, A clamping circuit theorem, Voltage Controlled Oscillator, Circuit to produce sharp pulses.

UNIT-IV

IC Fabrication:

IC Technology, Advantages and limitations of ICs, Basic monolithic IC technology, Basic processes used in monolithic technology, Monolithic integrated components, Transistors of monolithic ICs, Monolithic diodes.

Timer 555 IC:

Circuit of the 555 Timer, The 555 IC Timer-as a Monostable and Astable multivibrator.

Reference Book:

1. Hand Book of Electronics by Gupta and Kumar, Pragati Prakashan, Meerut (Basic)
2. Integrated Electronics by Milmann and Halkias
3. Electronics and radio engineering by M.L.Gupta
4. OP-AMP and linear Integrated circuits by R.A.Gayakwad,PHI Pub.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	**MSPHY**	**PROGRAM NAME**		**M.SC.PHYSICS**
COURSE CODE	**MSPHY 101ES**	**SEMESTER**		**1**
SPACE PHYSICS				
COURSE TYPE	**ELECTIVE SUBJECT**	**TOTAL CREDIT:**	**02**	
TEACHING TIME (HOURS)	**EXAMINATION MARKING SCHEME**			
THEORY (HRS)	**PRACTICAL (MARKS)**	**INTERNAL (MARKS)**	**EXTERNAL (MARKS)**	**TOTAL (MARKS)**
2 X 15 = 30	**-**	**-**	**50 (2.0 HRS)**	**50**

UNIT-I

Basic Concepts of Earth's Atmosphere:

Atmosphere nomenclature, Hydrostatic equations scale height, Geopotential height, Chemical concepts of atmosphere, Thermodynamic considerations, elementary chemical kinetics composition and chemistry of middle atmosphere and thermosphere.

Structure and Variability of Earth's Ionosphere:

Introduction to ionosphere, photochemical processes, Chapman's theory of photo ionization, production of ionospheric layers, morphology of the ionosphere

UNIT-II

Aurora and Airglow:

Night glow, Dayglow, Twilight glow, Aurora, Photometer for airglow measurement, applications of Airglow measurement for ionospheric dynamics and composition.

Magnetosphere:

Circulation in the magnetosphere, magnetospheric electric fields, particles in the magnetosphere, plasma sphere and its dynamics, magnetospheric current system, magneto pause current tail current ring current and Birlkeland current.

Reference Book

1. Introduction to Ionosphere and Magnetosphere, J.A. Ratcliff Ratcliff CUP
2. The Solar-Terrestrial Environment, JK. Hargreaves CUP
3. Introdution Space Physics, M.J. Kievelson CUP
4. Chemistry Sensing and Image Interpretation, M. Lillesand and R.L. Kiefer 4th Edition John Wiley & Sons
5. The solar terrestrial environment, J K Hargreaves CUP
6. Space Plasma Physics, A C Das Narosa Pub

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PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 102ES	SEMESTER		1
ENERGY TECHNOLOGY AND STORAGE SYSTEMS				
COURSE TYPE	ELECTIVE SUBJECT	TOTAL CREDIT:	02	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
2 X 15 = 30	-	-	50 (2.0 HRS)	50

UNIT-I

ENERGY TECHNOLOGY:

Geothermal Energy:

Introduction, Applications, Utilization of Geothermal Energy, Geothermal Energy Resources, Hydro Geothermal Resources, Hot Dry Rock Geothermal Resources.

Wind Energy:

Introduction, Applications of Wind Energy and Historical Background, Merits and limitations of Wind energy Conversion, Nature and Origin of Wind, Wind Energy Quantum, Variables in Wind Energy Conversion systems, Wind power density, Power in wind Stream, Wind turbine Efficiency.

Ocean Energy Technologies:

Introduction to energy from Ocean, Ocean Energy Resources, Off-shore and On-shore Ocean energy conversion Technologies, Advantages and limitations of Ocean energy conversion Technologies

UNIT-II

ENERGY STORAGE SYSTEMS:

Introduction, Energy storage systems for Electrical UTILITY Peak Shaving, Pumped Hydro Energy Storage Plants and Underground Pumped Hydro, Compressed Air Energy Storage, Battery Energy Storage Systems, Lead Acid Battery Cells Nickel-Cadmium Battery, Advanced Batteries, Supper Conducting Magnet Energy Storage, Advanced Flywheel Energy Storage, Thermal Energy Storage-thermal sensible heat storage and Latent heat energy storage, Chemical Energy Storage.

Reference Book

1. Energy TechnologyS.Rao and Dr. B.B. Parulekar1st editionKhanna Pub.-1995
2. Solar Energy conversion, An introductory course , A. E. Dikon and J. D. Loslie
3. Principles of Energy ConversionArchie W. Cupl Jr.

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Program code :		**MSPHY**	**Program Name :**	**M.Sc PHYSICS**
Course Code		**MSPHYPR**	**Semester :**	**1**
PRACTICALS(PCT)				
Course type :		**Practical**	**Total credit :**	**06**
Teaching time (hours)		**Examination Marking scheme**		
Theory (hrs)	**Practical (hrs)**	**Internal (Marks)**	**External (Marks)**	**Total (Marks)**
	12 per week		**150**	**150**

Group – I

1. e/m by Magnetron Valve.
2. Temperature Co-efficient of Platinum resistance Thermometer by Carry Foster or C.G. Bridge.
3. Study of Hall Effect.
4. Study of hysteresis of Anchor ring / transformer using C.R.O.
5. E.B.Plate (Determination of unknown wavelength and air gap).
6. F.P. Interferometer.
7. L by Rayleigh's method
8. An optical method for determining dielectric constant, dipole moment andpolarizability of a polar liquid by Hollow Prism.
9. Computer
10. Computer

Group – II

1. Transistorized R.C. Phase shift Oscillator.
2. UJT as a Relaxation Oscillator.
3. Astable Multivibrator.
4. Study of Power Amplifier.
5. FET amplifier.
6. Inverting OP-AMP.
7. Differential Amplifier.
8. Regulated Power Supply(78xx & 79xx).
9. MOSFET Characteristics.
10. Scmitt trigger using transistor.

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M.Sc. (Physics) CBCS Syllabus 2019	
Document code	SYLLABUS MSPHY2019
Revision No.	00
Name of Faculty	SCIENCE
Faculty Code	SC
Program Name	MASTER OF SCIENCE (PHYSICS)
Program Code	MSPHY
Effective from	June 2019

PROGRAM : HNGU 2057

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The proposed New Course in **M.Sc. PHYSI CSPROGRAM** is based on Choice Based Credit System (CBCS) which is in force from June-2019.

CBCS Course Pattern

1. This Program is divided into **four Se mesters** (Two Years). The duration of an academic year consists of two semesters, each of **15** weeks for teaching. The academic session in each semester will provide **90** teaching days. 24 credit each semester X 4 semester=96 credits at master level.
2. There will be three categories of courses/papers in this Program:
   - **A.** **FOUR** Compulsory-Core theory courses with 4 credits each in first three semesters and Three Compulsory-Core theory courses with 4 credits each **I nSe mesterIV.**
   - **B.** **One** Choice Based Elective Course (disciplinary/interdisciplinary) with 2 credits in First Three semesters.
   - **C.** **One** Practical course (PR) with 6 credits in first three semesters.
   - **D.** **In Semester IV**, instead of practical there is a project/field work with 12 - credits.
3. Detailed Course Pattern for each Semester is given bellow.

The Proposed New Structure for M.Sc. Course is based on choice Based Credit System (CBCS) which is in force from June – 2019

M.Sc.: Semester – I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – I	Core-I	2 : 30	70	30	100	4	4
Paper – II	Core-II	2 : 30	70	30	100	4	4
Paper – III	Core-III	2 : 30	70	30	100	4	4
Paper – IV	Core-IV	2 : 30	70	30	100	4	4
Practical : Paper – I	Pract-I	3	75	--	75	6	3
Practical : Paper – II	Pract-II	3	75	--	75	6	3
Elective Course (Any One) Disciplinary/ Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Se mester –I I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – V	Core-V	2 : 30	70	30	100	4	4
Paper – VI	Core-VI	2 : 30	70	30	100	4	4
Paper – VII	Core-VII	2 : 30	70	30	100	4	4
Paper – VIII	Core-VIII	2 : 30	70	30	100	4	4
Practical : Paper – III	Pract-III	3	75	--	75	6	3
Practical : Paper – IV	Pract-IV	3	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – IX	Core-IX	2 : 30	70	30	100	4	4
Paper – X	Core-X	2 : 30	70	30	100	4	4
Paper –XI	Core-XI	2 : 30	70	30	100	4	4
Paper – XII	Pract-XII	2 : 30	70	30	100	4	4
Practical : Paper – V	Pract-V	3	75	--	75	6	3
Practical : Paper –VI	Pract-VI	3	75	–	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Semester – IV

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – XIII	Core-X	2 : 30	70	30	100	4	4
Paper – IX	Core-XI	2 : 30	70	30	100	4	4
Paper – XV	Core-XII	2 : 30	70	30	100	4	4
Project	PROJECT	4	210	90	300	18	12
TOTAL			420	180	600	30	24

NOTE:

1. For 4 credit course: Each syllabus is of 4 Units having equal weightage.
2. For 2 credit course: Each syllabus is of 2 Units having equal weightage.
3. There is no section in semester end examinations i.e. questions Paper is without sections.
4. For question paper of 70 marks: Each Question paper contains 4 questions: Q-1 from unit-I of 18 marks, Q-2 from unit-II of 17 marks, Q-3 from unit-III of 18 marks and Q-4 from unit – IV of 17 marks.
5. For question paper of 35 marks: Each Question paper contains 3 questions: Q-1 from unit-I of 12 marks, Q-2 from unit-II of 12 marks, and last Q-3 is of short questions and objective types having 11 marks from unit I and unit II.

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
1	MSPHY101CC	CC	MATHEMATICAL PHYSICS-1AND"C" PROGRAMMING-1	70		30		4	100	
1	MSPHY102CC	CC	CLASSICAL MECHANICS -1 AND ELECTRODYNAMICS-1	70		30		4	100	
1	MSPHY103CC	CC	QUANTUM MECHANICS-1 AND SOLID STATE PHYSICS-1	70		30		4	100	
1	MSPHY104CC	CC	ELECTRONICS-1	70		30		4	100	
1		PRACT			150			6	150	
1	MSPHY101ES	ES	SPACE PHYSICS	35		15		2	50	Any one from Two ES PAPER
1	MSPHY102ES	ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS (ETS)	35		15		2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
2	MSPHY201ES	CC	MATHEMATICAL PHYSICS-2 AND "C" PROGRAMMING-2	70		30		4	100	
2	MSPHY202CC	CC	STATISTICAL MECHANICS-1 COMPUTOR-1	70		30		4	100	
2	MSPHY203CC	CC	QUANTUM MECHANICS-2 AND SOLID STATE PHYSICS-2	70		30		4	100	
2	MSPHY204CC	CC	ELECTRONICS-2	70		30		4	100	
2		PRACT			150			6		
2	MSPHY201ES	ES	APPLICATION OF COMPUTOR IN PHYSICS	35		15		2	50	Any one from Two ES PAPER
2	MSPHY201ES	ES	SYNTHESIS OF MATERIALS	35		15		2	50	

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
3	MSPHY301CC	CC	NUCLEAR PHYSICS-1 INSTRUMENTS	70		30		4	100	
3	MSPHY302CC	CC	STATISTICAL MECHANICS-2 COMPUTOR-2	70		30		4	100	
3	MSPHY303CC	CC	QUANTUM MECHANICS-3 SOLID STATE PHYSICS-3,	70		30		4	100	
3	MSPHY304CC	CC	ELECTRONICS-3	70		30		4	100	
3		PRACT			150			6	150	
3	MSPHY301ES	ES	RESEARCH METHODOLOGY	35		15		2	50	Any one from Two ES PAPER
3	MSPHY301 ES	ES	MICROCONTROLLER	35		15		2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
4	MSPHY401CC	CC	NUCLEAR PHYSICS-2 BIO-PHYSICS	70		30		4	100	
4	MSPHY402CC	CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS-2	70		30		4	100	
4	MSPHY403CC	CC	QUANTUM MECHANICS-4 SOLID STATE PHYSICS-4,	70		30		4	100	
4		PR		210		90	-	12	300	

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PATTERN/SCHEME OF EXAMINATION

There will be examinations at the end of each semester ordinarily during November / December for odd semesters and during April/May for even semesters.

Theory Examinations:

Out of the total marks for each course/paper maximum 30% marks shall be earmarked for Internal Exam.(Through continuous internal evaluation process) and remaining 70% for External Exam. (Through semester-end examinations).

There will be one semester-end examination of two hours and thirty minutes duration for core theory papers and two hours for elective papers. Each answer script of semester end examination (theory) will be evaluated by internal as well as external examiner.

The passing marks in each paper shall be **40%.**

PRACTICAL EXAMINATION:

In the case of science faculty, there will be a practical examination at the end of every semester. There will be **TWO** Practical (one from each groups) (75Marks each for Sem.-I to Sem.-III) in the Exam. The passing marks for practical will be **40%. The practical examinations shall be conducted with one internal and one external examiner.**

In 4th Semester one minor project work there will be of 300 marks. Assessment method is given bellow.

Project Report (70 Marks): Aims & Objectives-Clearly stated and achieved? Layout, Writing style, quality of Figures, Tables, Proper organization of work etc.Use of Lib./Int./Ref.: Literature review, survey, referencing etc

Presentation (70 Marks): Way of presentation, quality of presentation, Language, clarity of speech, Method of analysis, conclusion and Recommendations, Discussion of work etc.

Viva-Voce (70 Marks): ability to answer quarries and question.

There will be no internal assessment test for practical, and Elective coursesin first three semester but in fourth semester there will be internal assessment for Project work .

INTERNAL ASSESSMENT

For each paper/course in a semester there will be Continuous internal evaluation process which includes

- Unit Test / Internal Test
- MCQ Test / QUIZ Test/Viva
- Seminar/ Poster Presentation/ Assignment work/Workshop
- Attendance - Regularity & Study Tour
- Library work -Book Review

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STRUCTURE OF THE PAPER IN EXAMINATION

For Core Courses (Disciplinary/Interdisciplinary):

There will be total four questions. First question will be from Unit - I, Second question from Unit-II, Third question from Unit-III, and fourth question will be from Unit -4. All the questions are detailed as under. **(Total 70 Marks and 2 Hours thirty minutes time for the Paper)**

1	(a) Answer the following. (Any one out of two) (Theory questions)	8 Marks
1	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
1	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
2	(a) Answer the following. (Any one out of two) (Theory questions)	7 Marks
2	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
2	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
3	(a) Answer the following. (Any one out of two) (Theory questions)	8 Marks
3	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
3	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
4	(a) Answer the following. (Any one out of two) (Theory questions)	7 Marks
4	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
4	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks

For Elective Courses (Disciplinary/Interdisciplinary):

There will be three questions first and second questions are of 12 marks each and third question is of 11marks. First question will be from Unit - I, Second question from Unit-II, Third question will be from both Units. All the questions are detailed as under. **(Total 35 Marks and 2 Hours' time for the Paper)**

1	(a) Answer the following (Any one out of two) (Theory questions)	6 Marks
	(b) Answer the following (Any two out of three) (short note/ application/ Problem/ example type)	6 Marks
2	(a) Answer the following (Any one out of two) (Theory questions)	6 Marks
	(b) Answer the following (Anytwo out of three) (short note/ application/ Problem/ example type)	6 Marks
3	(a) Answer any three out of five.(Short question) (b) Answer any five out of eight.(objective)	6 Marks 5 Marks

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DETAILED CURRICULMSUMMARY IS GIVENIN FOLLOWING TABLE.

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
I	MSPHY-101CC	MATHEMATICAL PHYSICS -1 AND PROGRAMMING IN C-1	I	FUNCTION OF A COMPLEX VARIABLE
			II	INTEGRAL TRANSFORMS
			III	DECISION MAKING AND LOOPING & ARRAYS
			IV	CHARACTER ARRAYS AND STRINGS &FUNCTIONS
I	MSPHY-102CC	CLASSICAL MECHANICS-1 ELECTRODYNEMICS -1	I	CANONICAL TRANSFORMATION
			II	SMALL OSCILLATION AND ROTATING FRAME
			III	ELECTOMAGNETIC WAVES
			IV	POYNTING VECTOR AND THE FLOW OF POWER&GUIDED WAVES:
I	MSPHY-103CC	QUANTUM MECHANICS – ISOLID STATE PHYSICS-I	I	REPRESENTATION OF QUANTUM STATES
			II	ANGULAR MOMENTUM
			III	ENERGY BANDS
			IV	SEMICONDUCTOR CRYSTALS
I	MSPHY-104CC	ELECTRONICS-1	I	FETAMPLIFIER&MULTIVIBRATORS
			II	POWER AMPLIFIER
			III	WAVE SHAPING CIRCUIT
			IV	IC FABRICATION & TIMER 555 IC
I	MSPHY-101ES	SPACE PHYSICS	I	BASIC CONCEPTS OF EARTH'S ATMOSPHERE AND IONOSPHERE
			II	AURORA , AIRGLOW, AND MAGNETOSPHERE
I	MSPHY-102ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS	I	ENERGY TECHNOLOGY
			II	ENERGY STORAGE SYSTEMS

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
II	MSPHY-201CC	MATHEMATICAL PHYSICS -2 AND PROGRAMMING IN C-2	I	TENSOR ANALYSIS
			II	GROUP THEORY
			III	STRUCTURES AND UNIONS & POINTER
			IV	FILE MANAGEMENT IN C:&DEVELOPING A C PROGRAM
II	MSPHY-202CC	STATISTICAL MECHANICS-1 COMPUTER-1	I	BASIC CONCEPT IN STATISTICAL MECHANICS AND QUANTUM STATISTICS
			II	IDEAL BOSE AND FERMI SYSTEM
			III	WINDOWS AND POWER POINT
			IV	MICRO-SOFT WORD
II	MSPHY-203CC	QUANTUM MECHANICS–2 SOLID STATE PHYSICS-2	I	APPROXIMATION METHODS FOR STATIONARY STATES:
			II	EVOLUTION WITH TIME
			III	FERMI SURFACES AND METALS
			IV	DIAMAGNETISM AND PARAMAGNETISM
II	MSPHY-204CC	ELECTRONICS-2	I	OPERATIONAL AMPLIFIER
			II	DIGITAL ELECTRONICS
			III	MICROPROCESSOR – I
			IV	MICROPROCESSOR –II
II	MSPHY-201ES	APPLICATIONS OF COMPUTER IN PHYSICS	I	
			II	
II	MSPHY-202ES	SYNTHESIS OF MATERIAL	I	
			II	

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SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
III	MSPHY-301CC	NUCLEAR PHYSICS-1 AND INSTRUMENTS	I	TWO BODY FORCES
			II	NUCLEAR REACTION
			III	MICROSCOPY
			IV	UV-VIS
III	MSPHY-302CC	STATISTICAL MECHANICS-2 COMPUTER-2	I	PHASE EQUILIBRIA
			II	TRANSPORT PHENOMENA
			III	MICRO-SOFT EXCEL
			IV	COMPUTER NETWORK,INTERNET AND VIRUS
III	MSPHY-303CC	QUANTUM MECHANICS–3 SOLID STATE PHYSICS-3	I	SCATTERING THEORY
			II	PARTIAL WAVE ANALYSIS
			III	FERROMAGNETISM AND ANTI FERROMAGNETISM
			IV	MAGNETIC RESONANCE
III	MSPHY-304CC	ELECTRONICS	I	PULSE MODULATION AND DIGITAL COMMUNICATION
			II	DEMODULATION
			III	REMOTE SENSING
			IV	POWER ELECTRONICS
III	MSPHY-301ES	RESEARCH METHODOLOGY	I	
			II	
III	MSPHY-302ES	MICROCONTROLLER	I	
			II	

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
IV	MSPHY-401CC	NUCLEAR PHYSICS-2 AND BIO-PHYSICS	I	NUCLEAR MODEL
			II	ELEMENTARY PARTICLE
			III	SEPARATION TECHNIQUES
			IV	BIO-MECHANICS
IV	MSPHY-402CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS -2	I	NON LINEAR OSCILLATIONS AND CHAOS
			II	RELATIVISTIC ELECTRODYNAMICS
			III	WAVE GUIDE
			IV	RADIATION
IV	MSPHY-403CC	QUANTUM MECHANICS–4 SOLID STATE PHYSICS-4	I	RELATIVISTIC WAVE EQATIONS-1
			II	RELATIVISTIC WAVE EQATIONS-2
			III	OPTICAL PROCESSES AND EXCITONS
			IV	SOLAR CELL AND OPTO ELECTRONIC DEVICES
IV		PROJECT		

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 101 CC	SEMESTER		1
MATHEMATICAL PHYSICS -1 AND PROGRAMMING IN C-1				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT – I:

FUNCTION OF A COMPLEX VARIABLE:

Introduction, Analytic functions, Contour Integrals, Laurent series, Residue Theorem, Methods of Finding Residues, Evaluation of Definite Integrals by use of the Residue theorem, the point of Infinity, residue at infinity, Mapping, Some Applications of conformal mapping.

UNIT – II:

INTEGRAL TRANSFORMS:

Introduction, Laplace Transforms, Solution of Differential Equation by Laplace Transforms, Fourier Transforms, Convolution: Parseval's Theorem, Inverse Laplace Transform (Bromwich Integral), the Dirac delta function, Green functions, Integral transform solutions of partial differential equations.

UNIT – III:

DECISION MAKING AND LOOPING:

Introduction, while statement, do statement, do while, for statement, jumps in loops – continue and break statements.

ARRAYS:

Introduction, One dimensional arrays, declaration and initialization of arrays one dimensional arrays, two dimensional arrays, initialization of two dimensional arrays, multidimensional arrays.

UNIT- IV

CHARACTER ARRAYS AND STRINGS :

Declaring and initializing string variables, reading and writing strings, arithmetic operations on characters, Putting Strings together, comparison of two Strings, String handling functions, Table of strings, other features of strings.

FUNCTIONS:

Need for user defined functions, A multifunction program, Elements of user defined functions, Definition of functions, return values and their types, Function Calls, Function Declaration, category of functions,No argument and no return values, Arguments but no return values, Arguments with return values, No arguments but returns avalue,Functions that returns multiple values, nesting of functions, recursion.

REFERENCE BOOKS:

1. Mathematical methods in the physical sciences, M.L Boas., JohnWilley, 1966
2. Mathematical Physics, P. K. Chattopadhyaya, Wiley Eastern Ltd.
3. Mathematical methods for Physicists, G. Arfken, Academic Press, 1970
4. Mathematical Physics, S. Satyaprakash, Sultan Chand & Sons, 1990
5. Mathematical Physics, By H.K.DAS
6. Programming in ANSI C (IIInd Ed.), Programming in ANSI C (IIInd Ed.), TMH Pub.
7. C Programming language, Kernighan B.W. and Ritchie D.K. PHI Pub
8. Programming in C, Kochan S.G. CBS Pub.
9. Programming with C, By B.S. Gottfried
10. Programming in C, P. Day and M.Ghosh, Oxford Univ. Press, 2007

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 102 CC	SEMESTER		1
CLASSICAL MECHANICS-1 AND ELECTRODYNEMICS -1				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT - I

CANONICAL TRANSFORMATION :

Gauge transformations, Canonical transformation, Condition for transformation to be canonical, Illustration of canonical transformations, Poisson brackets, canonical equations in terms of Poisson brackets notation, Infinitesimal transformation, Relation between Infinitesimal transformation and Poisson brackets, The Hamilton Jacobi equations, separation of variables.

UNIT – II

SMALL OSCILLATION AND ROTATING FRAME:

Stable and unstable equilibriums, Small Oscillation in a system with one degree of freedom, Small Oscillation in a system with more than one degree of freedom, Normal coordinates and Normal frequencies of vibration.

Rotating Frame, Euler angles, Inertia tensor, Euler's equations of motion of a rigid body, Free motion of a rigid body, Motion of a symmetric top.

UNIT-III

ELECTOMAGNETIC WAVES:

Conductor and Dielectrics, Polarization, Reflection by a perfect conductor -normal incidence , Reflection by a perfect conductor -oblique incidence , Reflection by a perfect Dielectric -normal incidence , Reflection by a perfect Dielectric conductor -oblique incidence , surface impedance,

UNIT-IV

POYNTING VECTOR AND THE FLOW OF POWER:

Poynting theorem, Interpretation of Poynting vector, Instantaneous, average and complex Poynting vector, Power loss in plane conductor

GUIDED WAVES:

Waves between parallel planes, transverse electric waves (E_z=0), Transverse Magnetic wave (B_z=0), Characteristics of TE and TM waves. Transverse electromagnetic waves, Velocity of Propagation, Attenuation in Parallel plane guides, Wave impedance, Electric field and current flow within a conductor.

REFERENCE BOOKS:

1. Classical mechanics-A Text Book by Suresh Chandra, Narosa Publishing House New Delhi.
2. Classical Mechanics (2nd Edition), Herbert Goldstein, Addison - Wesley Publishing Co.
3. Classical Mechanics, V. B. Bhatia, Narosa Publishing house.
4. Classical Mechanics, G. Aruldhas PHI Pvt. Ltd.
5. Classical Mechanics, J. C. Upadhyaya Himalaya Publishing House.
6. Electromagnetics (2nd Edition), B. B. Laud, Wiley Eastern,
7. Electromagnetic waves and radiating systems, E. C. Jordan and K. G. Balmani Prentice Hall of India, New Delhi, 2008

8. Handbook of Electronics by Kumar and Gupta PragatiPrakashan
9. Introduction to Electrodynamics (2nd & 3rd Edition) J. Griffiths, Prentice Hall India Ltd.
10. Antennas and Radio wave propagation, R. E. Collins, McGraw Hill Book Company, 1987
11. Electronic Communication, D. Roddy and J. Coolen, Prentice Hall, 4th edition, 1995
12. Microwave Engineering, David M. Pozar, (Third Edition), Wiley- India.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 103 CC	SEMESTER		1
QUANTUM MECHANICS –I SOLID STATE PHYSICS-I				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT – I

The equations of motion, The Schrödinger picture, The Heisenberg picture, The Interaction picture. [(4.1)QM by V K Thankappan]

Some exactly soluble Three-dimensional problem:

Anisotropic oscillator, The isotropic oscillator, Normal modes of a coupled system of particles.

REPRESENTATION OF QUANTUM STATES

Quantum states, State vectors and wave functions, The Hilbert space of state vectors; Dirac notation. Dynamical variables and linear operators. Representations. Dynamical variables as matrix operators. Product of operators Self-adjointness and Hermiticity, diagonalization, Continuous basis, The Schrödinger representation. Degeneracy-Labeling by commuting observables. Change of Basis,- unitary transformations, unitary transformations induced by change of co-ordinate system: Translations. Unitary transformation induced by rotation of coordinate system, Algebra of rotation generators, Transformation of Dynamical variables, symmetries and conservation laws.

UNIT - II

ANGULAR MOMENTUM :

Quantum theory of angular momentum and its eigenvalue spectrum. Matrix representation of angular momentum operators, spin angular momentum, Pauli matrices and their properties, total wave function, non-relativistic Hamiltonian including spin. Addition of angular momenta, definition of Clebsch-Gordan coefficients, Phase convention, spin-wave function for a system of two spin-1/2 particles, Identical particles with spin, addition of spin and orbital angular momenta.

UNIT-III

ENERGY BANDS

Nearly Free Electron Model, Origin of the Energy gap, Magnitude of the Energy Gap, Bloch Functions, Kronig- Penney Model, Wave Education Of Electron in a Periodic Potential, Restatement of the Bloch Theorem, Crystal Momentum of an Electron, Solution Of the Central Equation, Kronig- Penney Model in Reciprocal Space, Empty Lattice Approximation, Approximation Solution Near a Zone Boundary, Number of Orbitals in a Band, Metals and Insulators

UNIT-IV

SEMICONDUCTOR CRYSTALS:

Band Gap, Equations of Motion, Physical derivation of $\hbar\dot{k} = F$, Holes, Effective Mass, Physical Interpretation of the Effective Mass, Effective Masses in semiconductors, Silicon and Germanium Intrinsic Carrier Concentration, Intrinsic Mobility, Impurity conductivity, Donor States, Acceptor States, Thermal Ionization of Donors and Acceptors, Thermoelectric Effect, Semimetals, Super lattices, Bloch Oscillator, Zener Tunneling.

REFERENCE BOOKS :

1. A textbook of quantum mechanics P M Mathews and K V Venkatesan McGrawhill Education
2. Quantum Mechanics by L. I. Schiff, McGraw-Hill International student edition (1961).

3. Introduction to Quantum Mechanics by Powell and Crasemann Addison-Wesley (1961).
4. Quantum Mechanics by V.K. Thankappen, Wiely eastern Ltd.
5. Quantum Mechanics : Theory and applications by A. Ghatak and S. Lokanathan.
6. Introduction to Solid State Physics. Charles Kittel 7th Edition.
7. Introduction to Solid State Physics. J P Srivastava 4th Edition.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 104 CC	SEMESTER		1
ELECTRONICS-1				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT- I

FET AMPLIFIERS:

FET parameters, biasing the FET , basic FET amplifier, FET small signal, common source a. c. amplifier, The common drain or source follower, common gateamplifier, general treatment of low frequency common source and common drainamplifier common source amplifier at high frequency, common drain amplifier at high frequencies, MOSFET: Depletion MOSFET, Enhancement MOSFET, Differences between JFET and MOSFET, Handling precaution for MOSFET

Multivibrators:

Switching Characteristics of transistor, Multivibrators, AstableMultivibrator, Monostable Multivibrator, Bi-stable Multivibrator.

UNIT-II

POWER AMPLIFIER:

Introduction, Difference between Voltage and Power amplifiers, Performance quantities of power amplifiers, Class-A power amplifier, and power distribution, Transformer coupled class –A amplifier, Power consideration and dissipation, Class-B power amplifier, Class-A Push-Pull power amplifier, Class-B Push-Pull amplifier, Tuned amplifiers, Single tuned inductively coupled transistor amplifier, Double tuned transistor amplifier.

UNIT-III

WAVE SHAPING CIRCUIT:

linear wave shaping, the high pass RC circuit, High pass RC circuit as differentiator, the Low pass RC circuit, Low pass circuit as an integrator, Non Linear wave shaping, PN junction diode switching times, Diode clipper circuits, comparison of shunt and series diode clippers, Double ended PN junction clippers, Double ended clippers using Zener diodes,

Clamping circuits: Zero Level Clamping circuits, Clamping at a given reference D.C. voltage, Design consideration of clamping circuit, A clamping circuit theorem, Voltage Controlled Oscillator, Circuit to produce sharp pulses.

UNIT-IV

IC Fabrication:

IC Technology, Advantages and limitations of ICs, Basic monolithic IC technology, Basic processes used in monolithic technology, Monolithic integrated components, Transistors of monolithic ICs, Monolithic diodes.

Timer 555 IC:

Circuit of the 555 Timer, The 555 IC Timer-as a Monostable and Astable multivibrator.

Reference Book:

1. Hand Book of Electronics by Gupta and Kumar, Pragati Prakashan, Meerut (Basic)
2. Integrated Electronics by Milmann and Halkias
3. Electronics and radio engineering by M.L.Gupta
4. OP-AMP and linear Integrated circuits by R.A.Gayakwad,PHI Pub.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	**MSPHY**	**PROGRAM NAME**		**M.SC.PHYSICS**
COURSE CODE	**MSPHY 101ES**	**SEMESTER**		**1**
SPACE PHYSICS				
COURSE TYPE	**ELECTIVE SUBJECT**	**TOTAL CREDIT:**	**02**	
TEACHING TIME (HOURS)	**EXAMINATION MARKING SCHEME**			
THEORY (HRS)	**PRACTICAL (MARKS)**	**INTERNAL (MARKS)**	**EXTERNAL (MARKS)**	**TOTAL (MARKS)**
2 X 15 = 30	**-**	**-**	**50 (2.0 HRS)**	**50**

UNIT-I

Basic Concepts of Earth's Atmosphere:

Atmosphere nomenclature, Hydrostatic equations scale height, Geopotential height, Chemical concepts of atmosphere, Thermodynamic considerations, elementary chemical kinetics composition and chemistry of middle atmosphere and thermosphere.

Structure and Variability of Earth's Ionosphere:

Introduction to ionosphere, photochemical processes, Chapman's theory of photo ionization, production of ionospheric layers, morphology of the ionosphere

UNIT-II

Aurora and Airglow:

Night glow, Dayglow, Twilight glow, Aurora, Photometer for airglow measurement, applications of Airglow measurement for ionospheric dynamics and composition.

Magnetosphere:

Circulation in the magnetosphere, magnetospheric electric fields, particles in the magnetosphere, plasma sphere and its dynamics, magnetospheric current system, magneto pause current tail current ring current and Birlkeland current.

Reference Book

1. Introduction to Ionosphere and Magnetosphere, J.A. Ratcliff Ratcliff CUP
2. The Solar-Terrestrial Environment, JK. Hargreaves CUP
3. Introdution Space Physics, M.J. Kievelson CUP
4. Chemistry Sensing and Image Interpretation, M. Lillesand and R.L. Kiefer 4th Edition John Wiley & Sons
5. The solar terrestrial environment, J K Hargreaves CUP
6. Space Plasma Physics, A C Das Narosa Pub

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 102ES	SEMESTER		1
ENERGY TECHNOLOGY AND STORAGE SYSTEMS				
COURSE TYPE	ELECTIVE SUBJECT	TOTAL CREDIT:	02	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
2 X 15 = 30	-	-	50 (2.0 HRS)	50

UNIT-I

ENERGY TECHNOLOGY:

Geothermal Energy:

Introduction, Applications, Utilization of Geothermal Energy, Geothermal Energy Resources, Hydro Geothermal Resources, Hot Dry Rock Geothermal Resources.

Wind Energy:

Introduction, Applications of Wind Energy and Historical Background, Merits and limitations of Wind energy Conversion, Nature and Origin of Wind, Wind Energy Quantum, Variables in Wind Energy Conversion systems, Wind power density, Power in wind Stream, Wind turbine Efficiency.

Ocean Energy Technologies:

Introduction to energy from Ocean, Ocean Energy Resources, Off-shore and On-shore Ocean energy conversion Technologies, Advantages and limitations of Ocean energy conversion Technologies

UNIT-II

ENERGY STORAGE SYSTEMS:

Introduction, Energy storage systems for Electrical UTILITY Peak Shaving, Pumped Hydro Energy Storage Plants and Underground Pumped Hydro, Compressed Air Energy Storage, Battery Energy Storage Systems, Lead Acid Battery Cells Nickel-Cadmium Battery, Advanced Batteries, Supper Conducting Magnet Energy Storage, Advanced Flywheel Energy Storage, Thermal Energy Storage-thermal sensible heat storage and Latent heat energy storage, Chemical Energy Storage.

Reference Book

1. Energy TechnologyS.Rao and Dr. B.B. Parulekar1st editionKhanna Pub.-1995
2. Solar Energy conversion, An introductory course , A. E. Dikon and J. D. Loslie
3. Principles of Energy ConversionArchie W. Cupl Jr.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
Program code :		**MSPHY**	**Program Name :**	**M.Sc PHYSICS**
Course Code		**MSPHYPR**	**Semester :**	**1**
PRACTICALS(PCT)				
Course type :		**Practical**	**Total credit :**	**06**
Teaching time (hours)		**Examination Marking scheme**		
Theory (hrs)	**Practical (hrs)**	**Internal (Marks)**	**External (Marks)**	**Total (Marks)**
	12 per week		**150**	**150**

Group – I

1. e/m by Magnetron Valve.
2. Temperature Co-efficient of Platinum resistance Thermometer by Carry Foster or C.G. Bridge.
3. Study of Hall Effect.
4. Study of hysteresis of Anchor ring / transformer using C.R.O.
5. E.B.Plate (Determination of unknown wavelength and air gap).
6. F.P. Interferometer.
7. L by Rayleigh's method
8. An optical method for determining dielectric constant, dipole moment andpolarizability of a polar liquid by Hollow Prism.
9. Computer
10. Computer

Group – II

1. Transistorized R.C. Phase shift Oscillator.
2. UJT as a Relaxation Oscillator.
3. Astable Multivibrator.
4. Study of Power Amplifier.
5. FET amplifier.
6. Inverting OP-AMP.
7. Differential Amplifier.
8. Regulated Power Supply(78xx & 79xx).
9. MOSFET Characteristics.
10. Scmitt trigger using transistor.

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હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૨૭૪૫, ૨૩૦૫૨૯, ૨૩૦૭૪૩, ૨૩૩૬૪૮ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in Website : www.ngu.ac.in

પરિપત્ર ક્રમાંક – ૪૪/ ૨૦૧૯

વિષયઃ વિજ્ઞાન વિદ્યાશાખાના અનુસ્નાતક કક્ષાના સેમેસ્ટર–૧ થી સેમેસ્ટર–૪ સુધીના નવા અભ્યાસક્રમોનું માળખું તેમજ નવા અભ્યાસક્રમ અંગે...

આ યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા અંતર્ગત વિષયોના અનુસ્નાતક વિભાગો તથા સંલગ્ન વિજ્ઞાન વિદ્યાશાખાની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, એકેડેમીક કાઉન્સિલ ની તા. ૫/૬/૨૦૧૮ ની સભા ના નિર્દિષ્ટ ઠરાવો અન્વયે UGC ની Model curriculum અંગેની Guideline સંદર્ભે વિજ્ઞાન વિદ્યાશાખા હેઠળના નીચેના વિષયોના અનુસ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમનું માળખું તેમજ અભ્યાસક્રમો **શૈક્ષણિક વર્ષઃ ૨૦૧૯–૨૦ થી ક્રમશઃ અમલ માં આવે તે રીતે** મંજૂર કરેલ છે. જેનો અમલ કરવા સારૂ સબંધિતોને આ સાથે મોકલવામાં આવે છે.

ક્રમ નં.	અભ્યાસક્રમ	એકેડેમીક કાઉન્સિલની તારીખઃ૦૫/૦૬/૨૦૧૮ના ઠરાવ ક્રમાંક	સેમેસ્ટર
૧	અભ્યાસક્રમો નું માળખું	૦૭	તમામ સેમેસ્ટર
૨	રસાયણશાસ્ત્ર	૪૪	સેમ.–૧ થી સેમ.–૨
૩	પ્રાણીશાસ્ત્ર	૪૫	સેમ.– ૧થી સેમ.–૪
૪	બાયોટેકનોલોજી	૪૬	સેમ.– ૧ થી સેમ.–૪
૫	ગણિતશાસ્ત્ર	૪૭	સેમ.–૧ થી સેમ.–૪
૬	એમ.એસ.સી. ઈલેકટ્રોનિકસ	૪૯	સેમ.–૧ થી સેમ.–૪
૭	ભૌતિકશાસ્ત્ર	૫૦	સેમ.–૧ થી સેમ.–૪

આ બાબતની સબંધિત અધ્યાપકો તથા વિધાર્થીઓને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

નોંધ :– (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજના ગ્રંથાલયમાં મૂકવાની રહેશે.
(૨) આ અભ્યાસક્રમ / સ્કીમ યુનિવર્સિટીની વેબ સાઈટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

સહી/–
કુલસચિવવતી

બિડાણ : ઉપર મુજબ

નં.–એ કે / અ× સ / ૧૦૧૬૩ / ૨૦૧૯
તારીખ : ૧૪ / ૦૩ / ૨૦૧૯

પ્રતિ,
૧. અધ્યક્ષશ્રી/ કો.ઓર્ડીનેટરશ્રી–વિજ્ઞાન વિદ્યાશાખા અંતર્ગત વિષયોના અનુસ્નાતક વિભાગો, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૨. સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓ
૩. ડૉ. એમ. બી. પ્રજાપતિ (ડીનશ્રી),ગણિતશાસ્ત્ર ભવન, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૪. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, **પાટણ.** (પાંચ નકલ)
૫. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, **પાટણ.** (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)
૬. સિસ્ટમ એનાલીસ્ટશ્રી, કોમ્પ્યુટર (રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ.યુનિવર્સિટી, **પાટણ.** તરફ પરિણામ માટે તથા વેબસાઈટ પર મૂકવા સારૂ.
૭. માન.કુલપતિશ્રી/ કુલસચિવશ્રીનું કાર્યાલય, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, **પાટણ.**
૮. અનુસ્નાતક પ્રશાખા (એકેડેમીક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.
૯. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ → પરિપત્રની ફાઈલ અર્થે
૧૦. સિલેકટ ફાઈલે. (૨ નકલ)

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North Gujarat University
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Hemchandracharya North Gujarat University

Accredited by NAAC with "A" Grade (CGPA 3.02)

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The Proposed New Structure for M.Sc. Course is based on choice Based Credit System (CBCS) which is in force from June – 2018

CBCS Course Pattern

1. This programme is divided into four Semesters (Two Years) . The duration of an academic year consists of two semesters, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. 24 credit each year X 4 semester= 96 credits master level.
2. There will be three categories of courses / papers in this programme :
   - A. Four Compulsory – Core theory courses with 4 credits each in each semester.
   - B. One Choice Based Elective Course (disciplinary / interdisciplinary) with 2 credits in each semester.
   - C. Two Practical's each of Three credits in each semesters .
   - D. In the IV Semester as above a,b,c or instead of above A,B, C ; a student can undertake Three core theory courses (12 - credits) and project / field work (12 - credits), OR Major Dissertation (24 - credits) OR as per decided by BOS.
3. Detailed Course Pattern for each Semester is given bellow.

M.Sc. : Semester – I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper - I	Core-I	2 : 30	70	30	100	4	4
Paper – II	Core-II	2 : 30	70	30	100	4	4
Paper – III	Core-III	2 : 30	70	30	100	4	4
Paper – IV	Core-IV	2 : 30	70	30	100	4	4
Practical : Paper – I	Pract-I	3/4	75	--	75	6	3
Practical : Paper – II	Pract-II	3/4	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	50	--	50	2	2
TOTAL			480	120	600	30	24

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M.Sc. : Semester – II

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – V	Core-V	2 : 30	70	30	100	4	4
Paper – VI	Core-VI	2 : 30	70	30	100	4	4
Paper – VII	Core-VII	2 : 30	70	30	100	4	4
Paper – VIII	Core-VIII	2 : 30	70	30	100	4	4
Practical : Paper – III	Pract-III	3/4	75	--	75	6	3
Practical : Paper – IV	Pract-IV	3/4	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	50	--	50	2	2
TOTAL			480	120	600	30	24

M.Sc. : Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – IX	Core-IX	2 : 30	70	30	100	4	4
Paper – X	Core-X	2 : 30	70	30	100	4	4
Paper – XI	Core-XI	2 : 30	70	30	100	4	4
Paper – XII	Core-XII	2 : 30	70	30	100	4	4
Practical : Paper – V	Pract-V	3/4	75	--	75	6	3
Practical : Paper – VI	Pract-VI	3/4	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	50	--	50	2	2
TOTAL			480	120	600	30	24

M.Sc. : Semester – IV

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – XIII	Core-XIII	2 : 30	70	30	100	4	4
Paper – XIV	Core-XIV	2 : 30	70	30	100	4	4
Paper – XV	Core-XV	2 : 30	70	30	100	4	4
Paper – XVI	Core -XVI	2 : 30	70	30	100	4	4
Practical : Paper – VII	Pract-VII	3/4	75	--	75	6	3
Practical : Paper – VIII	Pract-VIII	3/4	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	50	--	50	2	2
TOTAL			480	120	600	30	24

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OR

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – XIII	Core-XIII	2 : 30	70	30	100	4	4
Paper – XIV	Core-XIV	2 : 30	70	30	100	4	4
Paper – XV	Core-XV	2 : 30	70	30	100	4	4
Major Dissertation			210	90	300	18	12
TOTAL			420	180	600	30	24

NOTE :

1. For 4 credit course: Each syllabus is of 4 Units having equal weightage.
2. For 2 credit course: Each syllabus is of 2 Units having equal weightage.
3. There is no section in semester end examinations i.e. questions Paper is without sections.
4. For question paper of 70 marks: Each Question paper contains 4 questions: Q-1 from unit-I of 18 marks, Q-2 from unit-II of 17 marks, Q-3 from unit-III of 18 marks and last Q-4 from unit-Iv of 17 marks from entire course.
5. For question paper of 50 marks: Each Question paper contains 3 questions: Q-1 from unit-I of 20 marks, Q-2 from unit-II of 20 marks, and last Q-3 is of objective types having 10 marks from entire course.

[BOS may add some specifications with reference to above structure.]

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M.SC. (PHYSICS) CBCS Syllabus 2018	
Document code	SYLLABUS MSPHY2018
Revision No.	00
Name of Faculty	SCIENCE
Faculty Code	SC
Program Name	MASTER OF SCIENCE (PHYSICS)
Program Code	MSPHY
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The proposed New Course in **M.Sc. PHYSICS PROGRAM**is based on Choice Based Credit System (CBCS) which is in force from June-2018.

CBCS Course Pattern

1. This Program is divided into f**our Semesters** (Two Years). The duration of an academic year consists of two semesters, each of **15** weeks for teaching. The academic session in each semester will provide **90** teaching days. 24 credit each semester X 4 semester=96 credits at master level.
2. There will be **three** categories of courses/papers in this Program:
   - **A.** **FOUR** Compulsory-Core theory courses with 4 credits each in all semesters.
   - **B.** **One** Choice Based Elective Course (disciplinary/interdisciplinary) with 2 credits in FirstThree semesters.
   - **C.** **One** Practical course (PR) with 6 credits in first three semesters.
   - **D.** **In SemesterIV**, instead of practical there is a project/field work with 8-credits.
3. **Detailed**Course Pattern for each Semester is given bellow.

The Proposed New Structure for M.Sc. Course is based on choice Based Credit System (CBCS) which is in force from June – 2018

M.Sc.: Semester – I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – I	Core-I	2 : 30	70	30	100	4	4
Paper – II	Core-II	2 : 30	70	30	100	4	4
Paper – III	Core-III	2 : 30	70	30	100	4	4
Paper – IV	Core-IV	2 : 30	70	30	100	4	4
Practical : Paper – I	Pract-I	3	75	--	75	6	3
Practical : Paper – II	Pract-II	3	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	50	--	50	2	2
TOTAL			480	120	600	30	24

M.Sc.: Semester – II

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – V	Core-V	2 : 30	70	30	100	4	4
Paper – VI	Core-VI	2 : 30	70	30	100	4	4
Paper – VII	Core-VII	2 : 30	70	30	100	4	4
Paper – VIII	Core-VIII	2 : 30	70	30	100	4	4
Practical : Paper – III	Pract-III	3	75	--	75	6	3
Practical : Paper – IV	Pract-IV	3	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	50	--	50	2	2
TOTAL			480	120	600	30	24

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M.Sc.: Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – IX	Core-IX	2 : 30	70	30	100	4	4
Paper – X	Core-X	2 : 30	70	30	100	4	4
Paper –XI	Core-XI	2 : 30	70	30	100	4	4
Paper – XII	Pract-XII	2 : 30	70	30	100	4	4
Practical : Paper – V	Pract-V	3	75	--	75	6	3
Practical : Paper –VI	Pract-VI	3	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	50	--	50	2	2
TOTAL			480	120	600	30	24

M.Sc.: Semester – IV

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – XIII	Core-X	2 : 30	70	30	100	4	4
Paper – IX	Core-XI	2 : 30	70	30	100	4	4
Paper – XV	Core-XII	2 : 30	70	30	100	4	4
Project	PROJECT	4	210	90	300	18	12
TOTAL			420	180	600	30	24

NOTE:

1. For 4 credit course: Each syllabus is of 4 Units having equal weightage.
2. For 2 credit course: Each syllabus is of 2 Units having equal weightage.
3. There is no section in semester end examinations i.e. questions Paper is without sections.
4. For question paper of 70 marks: Each Question paper contains 4 questions: Q-1 from unit-I of 18 marks, Q-2 from unit-II of 17 marks, Q-3 from unit-III of 18 marks and last Q-4 from unit – IV of 17 marks. from entire course.
5. For question paper of 50 marks: Each Question paper contains 3 questions: Q-1 from unit-I of 20 marks, Q-2 from unit-II of 20 marks, and last Q-3 is of objective types having 10 marks from entire course.

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
1	MSPHY101CC	CC	MATHEMATICAL PHYSICS-1AND"C" PROGRAMMING-1	70		30		4	100	
1	MSPHY102CC	CC	CLASSICAL MECHANICS -1 AND ELECTRODYNAMICS-1	70		30		4	100	
1	MSPHY103CC	CC	QUANTUM MECHANICS-1 AND SOLID STATE PHYSICS-1	70		30		4	100	
1	MSPHY104CC	CC	ELECTRONICS-1	70		30		4	100	
1		PRACT			150			6	150	
1	MSPHY101ES	ES	SPACE PHYSICS	50				2	50	Any one from Two ES PAPER
1	MSPHY102ES	ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS (ETS)	50				2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
2	MSPHY201ES	CC	MATHEMATICAL PHYSICS-2 AND "C" PROGRAMMING-2	70		30		4	100	
2	MSPHY202CC	CC	STATISTICAL MECHANICS-1 COMPUTOR-1	70		30		4	100	
2	MSPHY203CC	CC	QUANTUM MECHANICS-2 AND SOLID STATE PHYSICS-2	70		30		4	100	
2	MSPHY204CC	CC	ELECTRONICS-2	70		30		4	100	
2		PRACT			150			6		
2	MSPHY201ES	ES	APPLICATION OF COMPUTOR IN PHYSICS	50				2	50	Any one from Two ES PAPER
2	MSPHY201ES	ES	SYNTHESIS OF MATERIALS	50				2	50	

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
3	MSPHY301CC	CC	NUCLEAR PHYSICS-1 INSTRUMENTS	70		30		4	100	
3	MSPHY302CC	CC	STATISTICAL MECHANICS-2 COMPUTOR-2	70		30		4	100	
3	MSPHY303CC	CC	QUANTUM MECHANICS-3 SOLID STATE PHYSICS-3,	70		30		4	100	
3	MSPHY304CC	CC	ELECTRONICS-3	70		30		4	100	
3		PRACT			150			6	150	
3	MSPHY301ES	ES	RESEARCH METHODOLOGY	50				2	50	Any one from Two ES PAPER
3	MSPHY301ES	ES	MICROCONTROLLER	50				2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
4	MSPHY401CC	CC	NUCLEAR PHYSICS-2 BIO-PHYSICS	70		30		4	100	
4	MSPHY402CC	CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS-2	70		30		4	100	
4	MSPHY403CC	CC	QUANTUM MECHANICS-4 SOLID STATE PHYSICS-4,	70		30		4	100	
4		PR		210		90	-	12	300	

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PATTERN/SCHEME OF EXAMINATION

There will be examinations at the end of each semester ordinarily during November / December for odd semesters and during April/May for even semesters.

Theory Examinations:

Out of the total marks for each course/paper maximum 30% marks shall be earmarked for Internal Exam.(Through continuous internal evaluation process) and remaining 70% for External Exam. (Through semester-end examinations).

There will be one semester-end examination of two hours and thirty minutes duration for core theory papers and two hours for elective papers. Each answer script of semester end examination (theory) will be evaluated by internal as well as external examiner.

The passing marks in each paper shall be **40%.**

PRACTICAL EXAMINATION:

In the case of science faculty, there will be a practical examination at the end of every semester. There will be **TWO**Practical (one from each groups) (75Marks each for Sem.-I to Sem.-III) in the Exam. The passing marks for practical will be **40%**. **The practical examinations shall be conducted with one internal and one external examiner**.

In 4th Semester one minor project work there will be of 300 marks. Assessment method is given bellow.

Project Report (70 Marks): Aims & Objectives-Clearly stated and achieved? Layout, Writing style, quality of Figures, Tables, Proper organization of work etc.Use of Lib./Int./Ref.: Literature review, survey, referencing etc

Presentation (70 Marks): Way of presentation, quality of presentation, Language, clarity of speech, Method of analysis, conclusion and Recommendations, Discussion of work etc.

Viva-Voce (70 Marks): ability to answer quarries and question.

There will be **no internal assessment test for** practical, and Elective coursesin first three semester but in fourth semester there will be internal assessment for Project work .

INTERNAL ASSESSMENT

For each paper/course in a semester there will be Continuous internal evaluation process which includes

- Unit Test / Internal Test
- MCQ Test / QUITZ Test/Viva
- Seminar/ Poster Presentation/ Assignment work/Workshop
- Attendance - Regularity & Study Tour
- Library work -Book Review

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STRUCTURE OF THE PAPER IN EXAMINATION

For Core Courses (Disciplinary/Interdisciplinary):

There will be total four questions. First question will be from Unit - I, Second question from Unit-II, Third question from Unit-III, and fourth question will be from all three Units. All the questions are detailed as under. **(Total 70 Marks and 2 Hours thirty minutes time for the Paper)**

1	(a) Answer the following (Any one out of two) (Theory questions)	8 Marks
1	(b) Attempt any two of following (out of three) (Two questions theory type and one question must be Application/Problem/Example type)	8 Marks
1	(c) Answer the following (Any one out of two) (Theory questions)	2 Marks
2	(a) Answer the following (Any one out of two) (Short answer questions or objective type questions)	7 Marks
2	(b) Attempt any two of following (out of three) (Two questions theory type and one question must be Application/Problem/Example type)	8 Marks
2	(c) Answer the following (Any one out of two) (Theory questions)	2 Marks
3	(a) Answer the following (Any one out of two) (Theory questions)	8 Marks
3	(b) Attempt any two of following (out of three) (Two questions theory type and one question must be Application/Problem/Example type)	8 Marks
3	(c) Answer the following (Any one out of two) (Theory questions)	2 Marks
4	(a) Answer the following (Any one out of two) (Theory questions)	7 Marks
4	(b) Attempt any two of following (out of three) (Two questions theory type and one question must be Application/Problem/Example type)	8 Marks
4	(c) Answer the following (Any one out of two) (Theory questions)	2 Marks

For Elective Courses (Disciplinary/Interdisciplinary):

There will be three questions first and second questions are of 20 marks each and third question is of 10 marks. First question will be from Unit - I, Second question from Unit-II, Third question will be from all three Units. All the questions are detailed as under. **(Total 50 Marks and 2 Hours' time for the Paper)**

1	(a) Answer the following (Any one out of two OR two out of three) (Theory questions)	10 Marks
	(b) Attempt any two of following (out of three) (Two questions theory type and one question must be Application/Problem/Example type)	10 Marks
2	(a) Answer the following (Any one out of two OR two out of three) (Theory questions)	10 Marks
	(b) Attempt any two of following (out of three) (Two questions theory type and one question must be Application/Problem/Example type)	10 Marks
3	Answer the following (Any five out of seven/eight)(Short answer questionor objective type questions)	10 Marks

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DETAILED CURRICULMSUMMARY IS GIVENIN FOLLOWING TABLE.

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
I	MSPHY-101CC	MATHEMATICAL PHYSICS -1 AND PROGRAMMING IN C-1	I	FUNCTION OF A COMPLEX VARIABLE
			II	INTEGRAL TRANSFORMS
			III	DECISION MAKING AND LOOPING & ARRAYS
			IV	CHARACTER ARRAYS AND STRINGS &FUNCTIONS
I	MSPHY-102CC	CLASSICAL MECHANICS-1 ELECTRODYNEMICS -1	I	CANONICAL TRANSFORMATION
			II	SMALL OSCILLATION AND ROTATING FRAME
			III	ELECTOMAGNETIC WAVES
			IV	POYNTING VECTOR AND THE FLOW OF POWER&GUIDED WAVES:
I	MSPHY-103CC	QUANTUM MECHANICS – ISOLID STATE PHYSICS-I	I	REPRESENTATION OF QUANTUM STATES
			II	ANGULAR MOMENTUM
			III	ENERGY BANDS
			IV	SEMICONDUCTOR CRYSTALS
I	MSPHY-104CC	ELECTRONICS-1	I	FETAMPLIFIER&MULTIVIBRATORS
			II	POWER AMPLIFIER
			III	WAVE SHAPING CIRCUIT
			IV	IC FABRICATION & TIMER 555 IC
I	MSPHY-101ES	SPACE PHYSICS	I	BASIC CONCEPTS OF EARTH'S ATMOSPHERE AND IONOSPHERE
			II	AURORA , AIRGLOW, AND MAGNETOSPHERE
I	MSPHY-102ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS	I	ENERGY TECHNOLOGY
			II	ENERGY STORAGE SYSTEMS

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
II	MSPHY-201CC	MATHEMATICAL PHYSICS -2 AND PROGRAMMING IN C-2	I	TENSOR ANALYSIS
			II	GROUP THEORY
			III	STRUCTURES AND UNIONS & POINTER
			IV	FILE MANAGEMENT IN C:&DEVELOPING A C PROGRAM
II	MSPHY-202CC	STATISTICAL MECHANICS-1 COMPUTER-1	I	BASIC CONCEPT IN STATISTICAL MECHANICS AND QUANTUM STATISTICS
			II	IDEAL BOSE AND FERMI SYSTEM
			III	WINDOWS AND POWER POINT
			IV	MICRO-SOFT WORD
II	MSPHY-203CC	QUANTUM MECHANICS–2 SOLID STATE PHYSICS-2	I	APPROXIMATION METHODS FOR STATIONARY STATES:
			II	EVOLUTION WITH TIME
			III	FERMI SURFACES AND METALS
			IV	DIAMAGNETISM AND PARAMAGNETISM
II	MSPHY-204CC	ELECTRONICS-2	I	OPERATIONAL AMPLIFIER
			II	DIGITAL ELECTRONICS
			III	MICROPROCESSOR – I
			IV	MICROPROCESSOR –II
II	MSPHY-201ES	APPLICATIONS OF COMPUTER IN PHYSICS	I	
			II	
II	MSPHY-202ES	SYNTHESIS OF MATERIAL	I	
			II	

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SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
III	MSPHY-301CC	NUCLEAR PHYSICS-1 AND INSTRUMENTS	I	TWO BODY FORCES
			II	NUCLEAR REACTION
			III	MICROSCOPY
			IV	UV-VIS
III	MSPHY-302CC	STATISTICAL MECHANICS-2 COMPUTER-2	I	PHASE EQUILIBRIA
			II	TRANSPORT PHENOMENA
			III	MICRO-SOFT EXCEL
			IV	COMPUTER NETWORK,INTERNET AND VIRUS
III	MSPHY-303CC	QUANTUM MECHANICS–3 SOLID STATE PHYSICS-3	I	SCATTERING THEORY
			II	PARTIAL WAVE ANALYSIS
			III	FERROMAGNETISM AND ANTI FERROMAGNETISM
			IV	MAGNETIC RESONANCE
III	MSPHY-304CC	ELECTRONICS	I	PULSE MODULATION AND DIGITAL COMMUNICATION
			II	DEMODULATION
			III	REMOTE SENSING
			IV	POWER ELECTRONICS
III	MSPHY-301ES	RESEARCH METHODOLOGY	I	
			II	
III	MSPHY-302ES	MICROCONTROLLER	I	
			II	

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
IV	MSPHY-401CC	NUCLEAR PHYSICS-2 AND BIO-PHYSICS	I	NUCLEAR MODEL
			II	ELEMENTARY PARTICLE
			III	SEPARATION TECHNIQUES
			IV	BIO-MECHANICS
IV	MSPHY-402CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS -2	I	NON LINEAR OSCILLATIONS AND CHAOS
			II	RELATIVISTIC ELECTRODYNAMICS
			III	WAVE GUIDE
			IV	RADIATION
IV	MSPHY-403CC	QUANTUM MECHANICS–4 SOLID STATE PHYSICS-4	I	RELATIVISTIC WAVE EQATIONS-1
			II	RELATIVISTIC WAVE EQATIONS-2
			III	OPTICAL PROCESSES AND EXCITONS
			IV	SOLAR CELL AND OPTO ELECTRONIC DEVICES
IV		PROJECT		

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 201 CC	SEMESTER		2
MATHEMATICAL PHYSICS -2 AND PROGRAMMING IN C-2				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT - I

TENSOR ANALYSIS :

Introduction , Definition, Contravariant vector, Covariant vector, Defination of Tensors of ranktwo, addition & subtraction of tensor, summation convention, symmetry - anti symmetry of secondrank tensor, Contraction, Direct product, Quotient rule, Pseudo tensors Dual tensor Levi-civita symbol, irreducible tensor, Non Cartesian tensors, Matric tensor, Christoffel symbols, christoffel symbols as derivatives of matric tensor, covariant derivative, Tensor derivative operators.

UNIT - II

GROUP THEORY :

Groups, subgroups and classes, Invariant, subgroups and factor groups, Homomorphism & Isomorphism, Group representation, Reducible & Irreducible representations, Schur's lemma, Orthogonality theorem, Character of representation, character table, Decomposing a reducible representation into Irreducible ones, Construction of representations, Lie groups & Lie algebra, The Three dimensional rotation groups SO(3), The special unitary groups SU(2) and SU(3), The homomorphism between SU(2) & SU(3), Some application of group theory in physics, (application- 4 classification of elementary particles)

UNIT- III

STRUCTURES AND UNIONS :

Introduction, Defining a structure, Declaring structure variables, Accessing structure members, Structure initialization, copying and comparing structure variables, Operation on individual members, Arrays of structure, Arrays within structure, Structures within structures, Structures and functions, Unions, Size of structures, Bit fields

POINTERS : Concept, accessing the address of variables, declaring and initializing pointers, accessing variables through pointers, pointer expressions, pointer increments and scale factor, pointers and arrays, pointer and character strings, pointers and functions, pointers and structures

UNIT- IV

File management in C:

Defining and Opening a File, Closing a File, I/O operations on Files, Error handuling during I/O operations, Random Access to Files, Command Line Arguments.

DEVELOPING A C PROGRAM:

Program Design, Program Coding, Common Programming Errors, Program Testing and Debugging, Program Efficiency.

REFERENCE BOOKS:

1. Mathematical methods in the physical sciences, M.L Boas., JohnWilley, 1966
2. Mathematical Physics, P. K. Chattopadhyaya, Wiley Eastern Ltd.
3. Mathematical methods for Physicists, G. Arfken, Academic Press, 1970
4. Mathematical Physics, S. Satyaprakash, Sultan Chand & Sons, 1990
5. Mathematical Physics, By H.K.DAS
6. Programming in ANSI C (IInd Ed.), Balagurusamy E.TMH Pub.

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7. C Programming language, Kernighan B.W. and Ritchie D.K. PHI Pub
8. Programming in C, Kochan S.G. CBS Pub.
9. Programming with C, By B.S. Gottfried
10. Programming in C, P. Day and M.Ghosh, Oxford Univ. Press, 2007

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PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 202 CC	SEMESTER		2
STATISTICAL MECHANICS-1 AND COMPUTER-1				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT-I

BASIC CONCEPT IN STATISTICAL MECHANICS AND QUANTUM STATISTICS :

Ergodic Hypothesis, Density distribution in phase space, The Liouville Theorem, Principle of conservation of density in phase space and principle of conservation of extension in phase space, Condition for statistical equilibrium, Density matrix, Liouville Theorem in quantum statistical mechanics, Condition for statistical equilibrium (in quantum statistics), Ensembles in quantum mechanics.

UNIT-II

IDEAL BOSE AND FERMI SYSTEM:

Photon gas, Einstein derivation of Planck's law, Bose-Einstein condensation, Fermi energy, An alternate derivation of Fermi energy, Mean energy of fermions at absolute zero, Fermi gas in metals, Fermi energy as a function of temperature, White dwarfs, Compressibility of a Fermi gas,

UNIT-III

WINDOWS AND POWER POINT:

Basic features and simple commands of operating system-windows and its uses. Accessories: Notepad, Calculator, Disk cleanup, Disk defragmentation, Windows explorer, Control panel.
Starting power point, creating presentations, creating presentation using templates, creating blank presentations, Formatting Slide, Animation (Transition), slide show, quitting power point.

UNIT-IV

MICRO-SOFT WORD:

Starting word, Word processor basics, word wrapping, adding or deleting tools, Selecting blocks of text, Copying text, Moving text, search and replace, editing a document, character formatting and style, Margin settings and columns, Justification of text, Line spacing, Setting tabs, Automatic tasks, Creating letters in readymade formats, Change case, Borders and Shading, Bullets and Numbering, Spelling and Grammar checking, Clip Art, Creating Drawing (with Toolbar), Auto correct, Auto Text, Printing a document, Short Keys, Help.
Menus in Microsoft word: Menus, Menu bar, Toolbar, Table etc.

REFERENCE BOOKS:

1. Fundamentals of statistical mechanics by B. B. Laud, 1998, New age international (P) LTD, Publishers, New Delhi. basic reference
2. Statistical Mechanics and Properties of Matter by E.S. Raja Gopal, Mc Millan Company of India Limited.
3. Statistical Mechanics - An Introduction by Evelyn Guha, Narosa Publishing House
4. Statistical Mechanics by R.K. Patharia, Pergamon Press
5. Funadamentals of Statistical Mechanics by F. Reif, Mc Graw Hill Companies
6. Statistical Mechanics - Theory and Applications by S.K. Sinha, Narosa Publishing House,New Delhi.

7. Statistical Mechanics BY B.K.Agarwal and Melvin Eisner
8. IT Tools and Applications by R.K. Taxali.
9. Comdex Computer Course Kit by Vikas Gupta, Publisher: Dreamtechl.
10. Microsoft Office 2000 Complete by Sybex, BPB Publication.
11. Peter Norton Complete Guide to Microsoft Office 2000 by Wayne S. Freeze, BPB Publication.
12. Fundamental of Information technology by: Deepak Bharihoke

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 203 CC	SEMESTER		2
QUANTUM MECHANICS–2 AND SOLID STATE PHYSICS-2				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT - I

APPROXIMATION METHODS FOR STATIONARY STATES:

PERTURBATION THEORY FOR DISCRETE LEVELS,

Equation in various orders of perturbation, theory, Non degenerate case, The Degenerate Case - Removal of degeneracy, The effect of electric field on energy level of an atom (Stark effect), Two electron atoms.

THE VARIATION METHOD:

Upper bound on ground state energy, Applications to excited state, Trial function Linear in variational parameters, Hydrogen molecule, Exchange interaction

WKB APPROXIMATION

The one dimensional Schrödinger equation (inclusive all cases & discussion relevant to perturbation theory/WKB method, The Bohr-Somerfield quantum condition, The WKB solution of radial wave equation

UNIT - II

EVOLUTION WITH TIME:

Exact Formal Solutions: The Schrödinger equation: General Solution, Propagators, Alteration of Hamiltonian: Transitions; Sudden Approximation.

Perturbation theory for Time Evolution Problems: Perturbative Solution for Transition Amplitude, Selection rules, First Order Transitions: Constant Perturbation, Transitions in the Second Order: Constant Perturbation. Harmonic Perturbations, Interaction of an atom with electromagnetic radiation, The dipole approximation

UNIT-III

FERMI SURFACES AND METALS:

Reduced Zone Scheme, Periodic Zone Scheme, Construction of Fermi Surfaces, Nearly Free Electrons, Electron Orbits, Hole Orbits, and Open Orbits, Calculation of Energy Bands, Tight Binding Method of Energy Bands, Wigner – Seitz Method, Cohesive Energy, Pseudo potential Methods, Experimental Method in Fermi surface Studies, Quantization of orbits in a Magnetic Field, De Hass- van Alphen Effect, Extremal Orbits, Fermi Surface of Copper, Magnetic Breakdown.

UNIT-IV

DIAMAGNETISM AND PARAMAGNETISM:

Langevin Diamagnetism Education, Quantum Theory of Diamagnetism of Mononuclear System, Quantum Theory of Para magnetism, Rare Earth Ions, Hund Rules, Irons group Irons , Crystal Field splitting, Quenching of the Orbital Angular Momentum, Spectroscopic Splitting Factor, Van Vleck Temperature – Independent Para magnetism, Cooling by Isentropic Demagnetization , Nuclear Demagnetization, Paramagnetic Susceptibility Conduction Electrons

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REFERENCE BOOKS :

1. A textbook of quantum mechanics P M Mathews and K V Venkatesan McGrawhill Education
2. Quantum Mechanics by L. I. Schiff, McGraw-Hill International student edition (1961).
3. Introduction to Quantum Mechanics by Powell and Crasemann Addison-Wesley (1961).
4. Quantum Mechanics by V.K. Thankappen, Wiely eastern Ltd.
5. Quantum Mechanics : Theory and applications by A. Ghatak and S. Lokanathan.
6. Quantum Mechanics by K.K. Chopra & G.C.Agarwal,Krishna Prakashan Media,(P)LTD.MEERUT
7. Introduction to Solid State Physics. Charles Kittel 7th Edition.
8. Introduction to Solid State Physics. J P Srivastava 4th Edition.
9. Solid State Physics by S.O.Pillai, New age international publishers
10. Fundamental of Solid State Physics by Saxena, Gupta and Kumar Pragati Prakashan

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 204 CC	SEMESTER		2
ELECTRONICS- 2				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT-I

OPERATIONAL AMPLIFIER:

Differential amplifier, The operational amplifier, A general purpose IC operational amplifier, open loop OP-AMP configuration, OP-AMP with negative feedback, Non Inverting and Inverting OP-AMP, Some Op-AMP Parameters, Effects of offset, Frequency Response and Stability,

Applications of OP-AMP: As a Scale Changing-Phase Shifting and Summing amplifier, Voltage Follower, Integrator, Differentiator, Logarithmic and Antilogarithmic amplifier, Bridge amplifier, Schmitt Trigger, Saw-tooth wave generator. Bootstrap Sweep generator,

UNIT-II DIGITAL ELECTRONICS

FLIP FLOP: RS FLIP-FLOPs, D FLIP-FLOPs, JK FLIP-FLOPs, Master Slave FLIP-FLOPs.

Shift Registers: Types of registers, serial in - serial out, serial in - parallel out, parallel in - serial out, parallel in - parallel out, Universal Shift Register.

Counters: Asynchronous Counters, Synchronous Counters, Decade Counters, Presettable Counters, Digital Clock.

Conversion: Binary Ladder, D/A Converters, A/D Converter-Simultaneous Conversion, A/D Converter-Counter Method.

UNIT – III

MICROPROCESSOR – I

Microprocessors: Advances in semiconductor technology, Organization of Microprocessor based system, Microprocessors instruction set and computer Languages: Machine language, 8085-Machine language, 8085-Assembly Language, Writing and executing an assembly language program, High level language, Operating systems.

Microprocessors architecture and its operational: M.I.O. and 8085 Bus organization, Internal data operations and the 8085 registers, Peripheral or externally initiated operations, Memory, Flip -Flop or latch as a storage element, Memory Map and addresses, Memory address range of a 1K memory chip, Memory classification,

Logic devices for interfacing: Tristate devices, Buffer, Decoder and Encoder

The 8085 MPU: The 8085 microprocessors (Pinout), Demultiplexing the bus AD7-- ADo , Generating control signals

UNIT – IV

MICROPROCESSOR – II

Introduction to 8085 Assembly Language Programming: The 8085 Programming Model, Instruction classifications, Instruction Format, How to write assemble and execute simple program, Overview of 8085 Instruction Set,

Introduction to 8085 Instruction: Data Transfer Operations, Arithmetic Operations, Logical operations, Branch Operations. Debugging a program static and dynamic debugging.

Programming Techniques with Additional Instructions: Programming Techniques: Looping, Counting and Indexing, Additional Data transfer and 16-bit Arithmetic instructions, Arithmetic

Operation related to Memory, Logical Operation: Rotate, Logical Operation: Compare. Common sources of errors.

REFERENCE BOOK:

1. Hand Book of Electronics (Basic) Gupta and Kumar, PragatiPrakashan, Meerut
2. Microprocessor Architecture, Programming and Applications with 8085 by Ramesh S. Gaonkar PIP Pub.
3. Introduction to microprocessor by R. Zalls B. P. B. Publication Delhi.
4. An introduction to microprocessor and applications by Krishna Kant,Macmillan.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 201ES	SEMESTER		2
APPLICATIONS OF COMPUTER IN PHYSICS				
COURSE TYPE	ELECTIVE SUBJECT	TOTAL CREDIT:	02	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
2 X 15 = 30	-	-	50 (2.0 HRS)	50

Software Package: **Mathematica**

UNIT-I

Introduction: interfaces, numerical and algebraic calculations.

Symbolic mathematics: differentiation, integration, sums and products, solving equations, differential equations, power series, limits, integral transforms, recurrence equations.

Numerical mathematics: numerical sums, products and integrals numerical equation solving, numerical differential equations, optimization.

Functions and programs,

UNIT-II

Lists

Graphics and sound,

Input/output

File operations.

Basic introduction of other scientific software packages such as MATLAB, MathCAD.

Reference Books:

1. S. Wolfram, Mathematica book, 5th ed. 2003.
2. Y. K. Singh, B. B. Chaudhuri, Matlab Programming, PHI, 2007.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	**MSPHY**	**PROGRAM NAME**		**M.SC.PHYSICS**
COURSE CODE	**MSPHY 202ES**	**SEMESTER**		**2**
SYNTHRSIS OF MATERIAL				
COURSE TYPE	**ELECTIVE SUBJECT**	**TOTAL CREDIT:**	**02**	
TEACHING TIME (HOURS)	**EXAMINATION MARKING SCHEME**			
THEORY (HRS)	**PRACTICAL (MARKS)**	**INTERNAL (MARKS)**	**EXTERNAL (MARKS)**	**TOTAL (MARKS)**
2 X 15 = 30	**-**	**-**	**50 (2.0 HRS)**	**50**

UNIT-I

PHYSICAL METHODS:

Solid State Reaction (Ceramic) Method: General Principles, Experimental Procedure: Reagents, Mixing, Container Material, HeatTreatment, Analysis, Kinetics of Solid State Reaction, Disadvantages.

THIN FILM SYNTHESIS:

Vacuum Evaporation, Sputtering, Spin Coating, Dip Coating, Pulsed Laser Deposition (PLD), Spray Pyrolysis, Chemical Vapour Deposition (CVD).

UNIT-II

CHEMICAL ROUTES:

Sol-gel Method: Principle, Lithium Niobate (LiNbO3), Doped Tin Dioxide, Silica for Optical Fiber

GROWTH OF SINGLE CRYSTALS:

Czochralski Method, Bridgman and Stockbarger Methods, Zone Melting, Precipitation from Solution or Melt; Flux Method, Epitaxial Growth of Thin Layers. Vapour Phase Transport Methods.

REFERENCE BOOKS:

1. Solid State Chemistry and its Applications, Anthony R. West (John Wiley & Sons)
2. Solid State Chemistry – An Introduction, Lesley Smart and Elaine Moore (Viva Books Pvt Limited)
3. Hand Book of Thin Film Technology, K. L. Chopra (MacGrow Hill)
4. Thin Film Fundamentals, Goswami A. (New Age International)
5. Hand Book of Thin-Film Deposition Processes and Techniques, Krishna Seshan (Noyes Pub.)
6. Crystal Growth – A Tutorial Approach,Eds. W. Bradsley, D.T.J. Hurle & J. B. Mullin (North Holland)
7. Crystal Growth Processes & Methods, P. Santhana Raghavan, P. Ramasamy (KRU Publications)

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
Program code :		**MSPHY**	**Program Name :**	**M.Sc PHYSICS**
Course Code		**MSPHYPR**	**Semester :**	**2**
PRACTICALS(PCT)				
Course type :		**Practical**	**Total credit :**	**06**
Teaching time (hours)		**Examination Marking scheme**		
Theory (hrs)	**Practical (hrs)**	**Internal (Marks)**	**External (Marks)**	**Total (Marks)**
	12 per week		**150**	**150**

Group – I

1. Hysterisis by Magnatometer Method.
2. Ultrasonic Interferometer-Determination of Velocity of Ultrasonic waves in a liquid/solid
3. 'e' by Milicon's method
4. Fiberless optical communication using Laser
5. G.M. counter.
6. Determination of Band gap energy of given Thermister.
7. Biprism
8. Fiber Optics
9. Microproccessor-arithmetic operations. ADDITION, SUBTRACTION, 1's and 2's compliment
10. C Programming.

Group – II

1. Class-B Push-Pull Amplifier.
2. Amplitude modulation and demodulation.
3. Non-Inverting OP-AMP.
4. Voltage follower.
5. IC-723 Regulated Power Supply.
6. OP-AMP Parameters.
7. IC-555 Timer.
8. R-S FLIP-FLOP
9. Study of Differentiator
10. Square wave generator.

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M.Sc. (Physics) CBCS Syllabus 2019	
Document code	SYLLABUS MSPHY2019
Revision No.	00
Name of Faculty	SCIENCE
Faculty Code	SC
Program Name	MASTER OF SCIENCE (PHYSICS)
Program Code	MSPHY
Effective from	June 2019

PROGRAM : HNGU 2057

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The proposed New Course in **M.Sc. PHYSI CSPROGRAM** is based on Choice Based Credit System (CBCS) which is in force from June-2019.

CBCS Course Pattern

1. This Program is divided into **four Se mesters** (Two Years). The duration of an academic year consists of two semesters, each of **15** weeks for teaching. The academic session in each semester will provide **90** teaching days. 24 credit each semester X 4 semester=96 credits at master level.
2. There will be three categories of courses/papers in this Program:
   - **A.** **FOUR** Compulsory-Core theory courses with 4 credits each in first three semesters and Three Compulsory-Core theory courses with 4 credits each **I nSe mesterIV.**
   - **B.** **One** Choice Based Elective Course (disciplinary/interdisciplinary) with 2 credits in First Three semesters.
   - **C.** **One** Practical course (PR) with 6 credits in first three semesters.
   - **D.** **In Semester IV**, instead of practical there is a project/field work with 12 - credits.
3. Detailed Course Pattern for each Semester is given bellow.

The Proposed New Structure for M.Sc. Course is based on choice Based Credit System (CBCS) which is in force from June – 2019

M.Sc.: Semester – I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – I	Core-I	2 : 30	70	30	100	4	4
Paper – II	Core-II	2 : 30	70	30	100	4	4
Paper – III	Core-III	2 : 30	70	30	100	4	4
Paper – IV	Core-IV	2 : 30	70	30	100	4	4
Practical : Paper – I	Pract-I	3	75	--	75	6	3
Practical : Paper – II	Pract-II	3	75	--	75	6	3
Elective Course (Any One) Disciplinary/ Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Se mester –I I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – V	Core-V	2 : 30	70	30	100	4	4
Paper – VI	Core-VI	2 : 30	70	30	100	4	4
Paper – VII	Core-VII	2 : 30	70	30	100	4	4
Paper – VIII	Core-VIII	2 : 30	70	30	100	4	4
Practical : Paper – III	Pract-III	3	75	--	75	6	3
Practical : Paper – IV	Pract-IV	3	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

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M.Sc.: Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – IX	Core-IX	2 : 30	70	30	100	4	4
Paper – X	Core-X	2 : 30	70	30	100	4	4
Paper –XI	Core-XI	2 : 30	70	30	100	4	4
Paper – XII	Pract-XII	2 : 30	70	30	100	4	4
Practical : Paper – V	Pract-V	3	75	--	75	6	3
Practical : Paper –VI	Pract-VI	3	75	–	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Semester – IV

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – XIII	Core-X	2 : 30	70	30	100	4	4
Paper – IX	Core-XI	2 : 30	70	30	100	4	4
Paper – XV	Core-XII	2 : 30	70	30	100	4	4
Project	PROJECT	4	210	90	300	18	12
TOTAL			420	180	600	30	24

NOTE:

1. For 4 credit course: Each syllabus is of 4 Units having equal weightage.
2. For 2 credit course: Each syllabus is of 2 Units having equal weightage.
3. There is no section in semester end examinations i.e. questions Paper is without sections.
4. For question paper of 70 marks: Each Question paper contains 4 questions: Q-1 from unit-I of 18 marks, Q-2 from unit-II of 17 marks, Q-3 from unit-III of 18 marks and Q-4 from unit – IV of 17 marks.
5. For question paper of 35 marks: Each Question paper contains 3 questions: Q-1 from unit-I of 12 marks, Q-2 from unit-II of 12 marks, and last Q-3 is of short questions and objective types having 11 marks from unit I and unit II.

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
1	MSPHY101CC	CC	MATHEMATICAL PHYSICS-1AND"C" PROGRAMMING-1	70		30		4	100	
1	MSPHY102CC	CC	CLASSICAL MECHANICS -1 AND ELECTRODYNAMICS-1	70		30		4	100	
1	MSPHY103CC	CC	QUANTUM MECHANICS-1 AND SOLID STATE PHYSICS-1	70		30		4	100	
1	MSPHY104CC	CC	ELECTRONICS-1	70		30		4	100	
1		PRACT			150			6	150	
1	MSPHY101ES	ES	SPACE PHYSICS	35		15		2	50	Any one from Two ES PAPER
1	MSPHY102ES	ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS (ETS)	35		15		2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
2	MSPHY201ES	CC	MATHEMATICAL PHYSICS-2 AND "C" PROGRAMMING-2	70		30		4	100	
2	MSPHY202CC	CC	STATISTICAL MECHANICS-1 COMPUTOR-1	70		30		4	100	
2	MSPHY203CC	CC	QUANTUM MECHANICS-2 AND SOLID STATE PHYSICS-2	70		30		4	100	
2	MSPHY204CC	CC	ELECTRONICS-2	70		30		4	100	
2		PRACT			150			6		
2	MSPHY201ES	ES	APPLICATION OF COMPUTOR IN PHYSICS	35		15		2	50	Any one from Two ES PAPER
2	MSPHY201ES	ES	SYNTHESIS OF MATERIALS	35		15		2	50	

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
3	MSPHY301CC	CC	NUCLEAR PHYSICS-1 INSTRUMENTS	70		30		4	100	
3	MSPHY302CC	CC	STATISTICAL MECHANICS-2 COMPUTOR-2	70		30		4	100	
3	MSPHY303CC	CC	QUANTUM MECHANICS-3 SOLID STATE PHYSICS-3,	70		30		4	100	
3	MSPHY304CC	CC	ELECTRONICS-3	70		30		4	100	
3		PRACT			150			6	150	
3	MSPHY301ES	ES	RESEARCH METHODOLOGY	35		15		2	50	Any one from Two ES PAPER
3	MSPHY301 ES	ES	MICROCONTROLLER	35		15		2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
4	MSPHY401CC	CC	NUCLEAR PHYSICS-2 BIO-PHYSICS	70		30		4	100	
4	MSPHY402CC	CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS-2	70		30		4	100	
4	MSPHY403CC	CC	QUANTUM MECHANICS-4 SOLID STATE PHYSICS-4,	70		30		4	100	
4		PR		210		90	-	12	300	

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PATTERN/SCHEME OF EXAMINATION

There will be examinations at the end of each semester ordinarily during November / December for odd semesters and during April/May for even semesters.

Theory Examinations:

Out of the total marks for each course/paper maximum 30% marks shall be earmarked for Internal Exam.(Through continuous internal evaluation process) and remaining 70% for External Exam. (Through semester-end examinations).

There will be one semester-end examination of two hours and thirty minutes duration for core theory papers and two hours for elective papers. Each answer script of semester end examination (theory) will be evaluated by internal as well as external examiner.

The passing marks in each paper shall be **40%.**

PRACTICAL EXAMINATION:

In the case of science faculty, there will be a practical examination at the end of every semester. There will be **TWO** Practical (one from each groups) (75Marks each for Sem.-I to Sem.-III) in the Exam. The passing marks for practical will be **40%. The practical examinations shall be conducted with one internal and one external examiner.**

In 4th Semester one minor project work there will be of 300 marks. Assessment method is given bellow.

Project Report (70 Marks): Aims & Objectives-Clearly stated and achieved? Layout, Writing style, quality of Figures, Tables, Proper organization of work etc.Use of Lib./Int./Ref.: Literature review, survey, referencing etc

Presentation (70 Marks): Way of presentation, quality of presentation, Language, clarity of speech, Method of analysis, conclusion and Recommendations, Discussion of work etc.

Viva-Voce (70 Marks): ability to answer quarries and question.

There will be no internal assessment test for practical, and Elective coursesin first three semester but in fourth semester there will be internal assessment for Project work .

INTERNAL ASSESSMENT

For each paper/course in a semester there will be Continuous internal evaluation process which includes

- Unit Test / Internal Test
- MCQ Test / QUIZ Test/Viva
- Seminar/ Poster Presentation/ Assignment work/Workshop
- Attendance - Regularity & Study Tour
- Library work -Book Review

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STRUCTURE OF THE PAPER IN EXAMINATION

For Core Courses (Disciplinary/Interdisciplinary):

There will be total four questions. First question will be from Unit - I, Second question from Unit-II, Third question from Unit-III, and fourth question will be from Unit -4. All the questions are detailed as under. **(Total 70 Marks and 2 Hours thirty minutes time for the Paper)**

1	(a) Answer the following. (Any one out of two) (Theory questions)	8 Marks
1	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
1	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
2	(a) Answer the following. (Any one out of two) (Theory questions)	7 Marks
2	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
2	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
3	(a) Answer the following. (Any one out of two) (Theory questions)	8 Marks
3	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
3	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
4	(a) Answer the following. (Any one out of two) (Theory questions)	7 Marks
4	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
4	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks

For Elective Courses (Disciplinary/Interdisciplinary):

There will be three questions first and second questions are of 12 marks each and third question is of 11marks. First question will be from Unit - I, Second question from Unit-II, Third question will be from both Units. All the questions are detailed as under. **(Total 35 Marks and 2 Hours' time for the Paper)**

1	(a) Answer the following (Any one out of two) (Theory questions)	6 Marks
	(b) Answer the following (Any two out of three) (short note/ application/ Problem/ example type)	6 Marks
2	(a) Answer the following (Any one out of two) (Theory questions)	6 Marks
	(b) Answer the following (Anytwo out of three) (short note/ application/ Problem/ example type)	6 Marks
3	(a) Answer any three out of five.(Short question) (b) Answer any five out of eight.(objective)	6 Marks 5 Marks

DETAILED CURRICULMSUMMARY IS GIVENIN FOLLOWING TABLE.

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
I	MSPHY-101CC	MATHEMATICAL PHYSICS -1 AND PROGRAMMING IN C-1	I	FUNCTION OF A COMPLEX VARIABLE
			II	INTEGRAL TRANSFORMS
			III	DECISION MAKING AND LOOPING & ARRAYS
			IV	CHARACTER ARRAYS AND STRINGS &FUNCTIONS
I	MSPHY-102CC	CLASSICAL MECHANICS-1 ELECTRODYNEMICS -1	I	CANONICAL TRANSFORMATION
			II	SMALL OSCILLATION AND ROTATING FRAME
			III	ELECTOMAGNETIC WAVES
			IV	POYNTING VECTOR AND THE FLOW OF POWER&GUIDED WAVES:
I	MSPHY-103CC	QUANTUM MECHANICS – ISOLID STATE PHYSICS-I	I	REPRESENTATION OF QUANTUM STATES
			II	ANGULAR MOMENTUM
			III	ENERGY BANDS
			IV	SEMICONDUCTOR CRYSTALS
I	MSPHY-104CC	ELECTRONICS-1	I	FETAMPLIFIER&MULTIVIBRATORS
			II	POWER AMPLIFIER
			III	WAVE SHAPING CIRCUIT
			IV	IC FABRICATION & TIMER 555 IC
I	MSPHY-101ES	SPACE PHYSICS	I	BASIC CONCEPTS OF EARTH'S ATMOSPHERE AND IONOSPHERE
			II	AURORA , AIRGLOW, AND MAGNETOSPHERE
I	MSPHY-102ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS	I	ENERGY TECHNOLOGY
			II	ENERGY STORAGE SYSTEMS

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
II	MSPHY-201CC	MATHEMATICAL PHYSICS -2 AND PROGRAMMING IN C-2	I	TENSOR ANALYSIS
			II	GROUP THEORY
			III	STRUCTURES AND UNIONS & POINTER
			IV	FILE MANAGEMENT IN C:&DEVELOPING A C PROGRAM
II	MSPHY-202CC	STATISTICAL MECHANICS-1 COMPUTER-1	I	BASIC CONCEPT IN STATISTICAL MECHANICS AND QUANTUM STATISTICS
			II	IDEAL BOSE AND FERMI SYSTEM
			III	WINDOWS AND POWER POINT
			IV	MICRO-SOFT WORD
II	MSPHY-203CC	QUANTUM MECHANICS–2 SOLID STATE PHYSICS-2	I	APPROXIMATION METHODS FOR STATIONARY STATES:
			II	EVOLUTION WITH TIME
			III	FERMI SURFACES AND METALS
			IV	DIAMAGNETISM AND PARAMAGNETISM
II	MSPHY-204CC	ELECTRONICS-2	I	OPERATIONAL AMPLIFIER
			II	DIGITAL ELECTRONICS
			III	MICROPROCESSOR – I
			IV	MICROPROCESSOR –II
II	MSPHY-201ES	APPLICATIONS OF COMPUTER IN PHYSICS	I	
			II	
II	MSPHY-202ES	SYNTHESIS OF MATERIAL	I	
			II	

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
III	MSPHY-301CC	NUCLEAR PHYSICS-1 AND INSTRUMENTS	I	TWO BODY FORCES
			II	NUCLEAR REACTION
			III	MICROSCOPY
			IV	UV-VIS
III	MSPHY-302CC	STATISTICAL MECHANICS-2 COMPUTER-2	I	PHASE EQUILIBRIA
			II	TRANSPORT PHENOMENA
			III	MICRO-SOFT EXCEL
			IV	COMPUTER NETWORK,INTERNET AND VIRUS
III	MSPHY-303CC	QUANTUM MECHANICS–3 SOLID STATE PHYSICS-3	I	SCATTERING THEORY
			II	PARTIAL WAVE ANALYSIS
			III	FERROMAGNETISM AND ANTI FERROMAGNETISM
			IV	MAGNETIC RESONANCE
III	MSPHY-304CC	ELECTRONICS	I	PULSE MODULATION AND DIGITAL COMMUNICATION
			II	DEMODULATION
			III	REMOTE SENSING
			IV	POWER ELECTRONICS
III	MSPHY-301ES	RESEARCH METHODOLOGY	I	
			II	
III	MSPHY-302ES	MICROCONTROLLER	I	
			II	

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
IV	MSPHY-401CC	NUCLEAR PHYSICS-2 AND BIO-PHYSICS	I	NUCLEAR MODEL
			II	ELEMENTARY PARTICLE
			III	SEPARATION TECHNIQUES
			IV	BIO-MECHANICS
IV	MSPHY-402CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS -2	I	NON LINEAR OSCILLATIONS AND CHAOS
			II	RELATIVISTIC ELECTRODYNAMICS
			III	WAVE GUIDE
			IV	RADIATION
IV	MSPHY-403CC	QUANTUM MECHANICS–4 SOLID STATE PHYSICS-4	I	RELATIVISTIC WAVE EQATIONS-1
			II	RELATIVISTIC WAVE EQATIONS-2
			III	OPTICAL PROCESSES AND EXCITONS
			IV	SOLAR CELL AND OPTO ELECTRONIC DEVICES
IV		PROJECT		

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 301 CC	SEMESTER		3
NUCLEAR PHYSICS-1 AND INSTRUMENTS				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT-I

NUCLEAR PROPERTIES:

Nuclear spin, electric moments, magnetic moments, a brief description of hyperfine structure of atomic spectra, effect of an external magnetic field on the hyperfine structure, determination of *I* from molecular band spectra, molecular beam resonance method – experiments on hydrogen and deuteron.

TWO-BODY FORCES:

Deuteron. Excited states of the deuteron, neutron proton scattering at low energies, scattering length, spin dependence of neutron proton scattering, singlet state in n-p system, effective range theory in n-p scattering, tensor forces, magnetic moment and electric quadrupole moment of the deuteron, proton proton scattering at low energy, exchange forces, meson theory of nuclear forces.

UNIT-II

NUCLEAR REACTIONS:

Nuclear reactions and cross sections, Resonance: Breit Wigner dispersionformula for $l = 0$, The compound nucleus, Continuum theory of nuclear reaction, Direct reactions, Theory of stripping reactions - semi classical description and wave mechanical description.

UNIT-III

MICROSCOPY:

Scanning Electron Microscopy (SEM)

Physical Basis and Primary Modes of Operation, Instrumentation, Sample Requirements, FESEM, Advantages over conventional SEM, Applications

Transmission Electron Microscopy (TEM)

Basic Principle, Resolution, Sensitivity, TEM Operation, Image Mode, Specimen Preparation

Scanning Tunneling Microscopy (STM) and Scanning Force Microscopy (SFM)

Introduction, Instrumentation, Topography, Profilometry, Sample Requirements

UNIT-IV

UV-VIS:

Introduction, principle of UV-vis spectroscopy, Beer-Lambert's law, molar absorbility, absorbing species, containing π, σ and η electrons, charge transfer absorption, Instrumentation of UV-vis spectroscopy: Radiation Sources, Wavelength Selectors, Monochromators, Sample Handling, Detectors, Signal Processing and Output Devices, Types of UV-Visible Spectrometers: Single Beam Spectrometers, Double Beam Spectrometers, Photodiode Array Spectrometer, applications.

REFERENCE BOOK:

1. Introduction to Nuclear physics Theory and Experimentby R.R.ROY and B.P.Nigam
2. Introduction to Nuclear physics, H.A. Enge
3. Nuclear physics by D.C.Tayal
4. Nuclear physics by IRVING KAPLAN

5. Introduction to nuclear physics an introduction by S.B.Patel, New Age International Publishers
6. Scanning Electron Microscopy, X-Ray Microanalysis, and Analytical Electron microscopy, A Laboratory Workbook, Patrick Echlin, Alton D. Romig Jr., Gwyn Williams
7. Elementary Organic Spectroscopy, Y R Sharma S. Chand.
8. Molecular Structure and Spectroscopy, G Aruldhas PHI publisher.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 302 CC	SEMESTER		3
STATISTICAL MECHANICS-2 AND COMPUTER-2				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT-I

PHASE EQUILIBRIA:

Equilibrium conditions,classification of phase transitions, phase diagram, Clausious-Clapeyron equation, Critical exponents, Van der Waal equations, second order phase transitions, Ginzburg-Landau theory, phase transition in ferromagnetic materials, liquid helium, Curie - Weiss theory of Magnetic transition, Ising Model, Ising Model in zeroth approximation, Exact solution of one dimensional Ising Model, Order parameters

UNIT-II

TRANSPORT PHENOMENA:

Mean collision time, Thermionic emission, Photoelectric effect, Molecular collisions, Effusion, Einstein relation for mobility, Distribution function, Boltzmann transport equation, Relaxation approximation, Boltzmann H-theorem, Maxwell-Boltzmann distribution from Boltzmann equation. Boltzmann H-theorem in Q.M.

UNIT-III

MICRO-SOFT EXCEL :

Introduction to spreadsheets, Use of spreadsheets, spreadsheets basics, Labels, Values and Functions, Formula, Functions, What-if analysis, Automatic recalculation, formatting spreadsheet, graphs.

Introduction to Excel : Functions of Microsoft Excel, starting ms-excel, Excel work environment, changing the size of work book and excel window, Cell and Cell address, Standard toolbar, Formatting toolbar, the formula bar, status bar, Components of an excel workbook, quitting ms-excel

Working in Excel : Moving inside a workbook, Moving the cell pointer quickly, Selecting a command, types of data, Entering data at cell address, Making changes to an entry, saving your workbook, closing the workbook, quitting ms-excel

Mathematical Calculations: Formulas using numbers, Formulas using cell address, Opening ms-excel and entering data, Defining functions, writing a function, Common excel functions

Manipulating data: Moving data, Copying data, Relative cell addressing, absolute cell addressing, Copying values, not formula or function, deleting rows and columns, Deleting contents of a row, Inserting rows, inserting columns, Automatic filling of entries, quitting ms-excel

Changing the layout: Aligning data, Increasing or decreasing the column width, Increasing or decreasing the height of rows, Erasing the contents of a sheet, Deleting data from the cell address, Setting column width to zero, Values formatting, Points to remember, Closing workbook and quitting excel

Simple Graphs: Drawing a graph, Naming the sheet, saving the workbook, printing and closing a graphic sheet, opening the saved graphic sheet, quitting ms-excel

Manipulating Sheets: Adding sheet to a workbook, Adding many sheet to a workbook, renaming a sheet and entering data in it, Moving sheet, Copying data between sheets, Protecting the workbook, Deleting a sheet from a workbook, Saving the workbook automatically, Closing the workbook, recovering the deleted workbook, quitting ms-excel.

UNIT-IV

COMPUTER NETWORK, INTERNET AND VIRUS:

Local Area Network(LAN), Metrepolean Area Network(MAN) Wide Area Network(WAN), Routing, Network topology.

Use of Internet, Web Brouser, Search Engine, Surfing, Mail(Draft,Send, Receive, Delete), TCP/IP, Uniform resource locator (URL), Internet service provider, Internet security, surfing.

Introduction to computer viruses, What is virus?, Classification of viruses, Latest known viruses, virus prevention, Anti virus.

REFERENCE BOOKS:

1. Fundamentals of statistical mechanics by B. B. Laud, 1998, New age international (P) LTD, Publishers, New Delhi. basic reference
2. Statistical Mechanics and Properties of Matter by E.S. Raja Gopal, Mc Millan Company of India Limited.
3. Statistical Mechanics - An Introduction by Evelyn Guha, Narosa Publishing House
4. Statistical Mechanics by R.K. Patharia, Pergamon Press
5. Funadamentals of Statistical Mechanics by F. Reif, Mc Graw Hill Companies
6. Statistical Mechanics - Theory and Applications by S.K. Sinha, Narosa Publishing House,New Delhi.
7. IT Tools and Applications by R.K. Taxali.
8. Comdex Computer Course Kit by Vikas Gupta, Publisher: Dreamtechl.
9. Microsoft Office 2000 Complete by Sybex, BPB Publication.
10. Peter NortonComplete Guide to Microsoft Office 2000 by Wayne S. Freeze, BPB Publication.
11. Fundamental of Information technology by: Deepak Bharihoke

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 303 CC	SEMESTER		3
QUANTUM MECHANICS–3 AND SOLID STATE PHYSICS-3				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT-I

SCATTERING THEORY:

The scatteing cross-section. General considerations : Kinematics of scattering process; Differential and Total crosssections, Wave mechanical picture of scattering: The scattering amplitude, Green functions : Formal expression for scattering Amplitude, The Born and Eikonal Approximations : The Born Approximation, The validity of the Born Approximation, The Born series, The Eikonal Approximation.

UNIT – II

PARTIAL WAVE ANALYSIS :

Asymptotic Behaviour of partial waves : phase shift, The scattering Amplitude in terms of phaseshifts, The Differential and Total cross-sections, Optical Theorem , Phase shiftt: relation to the potentials, Potentials of finite range, Low energy scattering, Exact soluble problems, Scattering by a square well, scattering by a hard sphere, scattering by a coulumb potential mutual scattering of two particles , Reduction of the two body problem : The center of mass frame , Transformation from centre of mass to Laboratory frame of reference , collisions between identical particles.

UNIT-III

FERROMAGNETISM AND ANTI FERROMAGNETISM:

Ferromagnetic Order, Curie Point and the Exchange Integral, Temperature Dependence of the Saturation, Magnetization, Saturation Magnetization at Absolute Zero, Magnons, Quantization of Spin Wave, Thermal Excitation of Magnons, Neutron Magnetic Scattering, Ferrimagnetic Order, Currie Temperature and Susceptibility of Ferrimagnets, Iron Garnets, Anti ferromagnetic Order, Susceptibility Below the Neel Temperature, Anti ferromagnetic Magnons, Ferromagnetic Domains, Anisotropy Energy, Transition Region between Domains, Origin of Domains, Coercivity and Hysteresis, Single Domain Particles, Geomagnetism and Biomagnetism, Magnetic Force Microscopy

UNIT-IV

MAGNETIC RESONANCE:

Nuclear Magnetic Resonance, Equation of Motion, Line Width, Motional Narrowing, Hyperfine Splitting, Examples: Paramagnetic Point Defects, F Centers in Alkali Halides, Donor Atoms in Silicon, Knight Shift, Nuclear Quadrupole Resonance, Ferromagnetic Resonance, Shape Effects in FMR, Spin Wave Resonance, Antiferromagnetic Resonance, Electron Paramagnetic Resonance, Exchange Narrowing, Zero-Filed Splitting, Principle of Maser Action, Three- Level Maser, Lasers

REFERENCE BOOKS :

1. A textbook of quantum mechanics P M Mathews and K V Venkatesan McGrawhill Education
2. Quantum Mechanics by L. I. Schiff, McGraw-Hill International student edition (1961).
3. Introduction to Quantum Mechanics by Powell and Crasemann Addison-Wesley (1961).
4. Quantum Mechanics by V.K. Thankappen, Wiely eastern Ltd.
5. Quantum Mechanics : Theory and applications by A. Ghatak and S. Lokanathan.
6. Quantum Mechanics by H.C.Verma

7. Quantum Mechanics by K.K. Chopra & G.C.Agarwal,Krishna Prakashan Media,(P)LTD.MEERUT
8. Introduction to Solid State Physics. Charles Kittel 7th Edition.
9. Introduction to Solid State Physics. J P Srivastava 4th Edition.
10. Solid State Physics by S.O.Pillai, New age international publishers
11. Fundamental of Solid State Physics by Saxena, Gupta and Kumar Pragati Prakashan

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 304 CC	SEMESTER		3
ELECTRONICS - 3				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT-I

PULSE MODULATION AND DIGITAL COMMUNICATION:

Pulse Modulation:

Pulse amplitude modulation, Pulse code modulation, PCM Receiver, Pulse time modulation, Pulse position modulation, Pulse width modulation. Synchronization, Probability of bit error in base band transmission, matched filter, Bit-timing recovery, carrier recovery systems.

Digital carrier systems:

Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), FSK Transmitter, FSK Receiver, Phase Shift Keying (PSK).

UNIT – II

DEMODULATION:

Principle of A.M. detection and classification ofA.M. detectors, Envelope diode detector, op-amp envelope detector, automatic volume control, frequency demodulation, slope detector, Balanced slope detector, Foster-seeley discriminator, limiter, Radio detector, Quadrature detector, phase locked loop.

UNIT – III

REMOTE SENSING :

Remote Sensing Principles:

Electromagnetic remote sensing process, Radiation laws, Atmospheric interaction with electromagnetic radiation, Interaction with earth surface and spectral signatures,

Remote Sensing Platforms and Sensor: Satellite system parameters – instrumental parameters, viewing parameters, Sensor parameters – spatial resolution, spectral resolution, radiometric resolution, Imaging sensor systems.

Fundamental of GIS:

GIS Definitions and Terminology, GIS Architecture, Components of a GIS, GIS Work Flow.

UNIT – IV

POWER ELECTRONICS:

Fundamental of Power Electronics: Important rules for finding Fourier Series. Expression for Voltage, Current and Power factor. Laplace Transform, Inverse Laplace Transform. Performance parameter of Rectifiers. Introduction to Discrete Fourier transform.

Basic of Electrical Machines: D.C. motors, Types of D.C. motors, torque speed characteristics. Induction motors, Types of Induction motors. Synchronous machines and stepper motors.

Convertes: Single phase and three phase converters, Series converters, Dual converters.Effect of source and leakage inductance on the performance, Power factor improvement. Single phase dual converter, three phase dual converter, three phase AC voltage controllers

REFERENCE BOOKS:

1. Hand Book of Electronics (Basic) Gupta and Kumar, Pragati Prakashan, Meerut
2. Remote sensing and Geographical Information systems, Anji Reddy, B.S. Publications, (3rd edition), 2006

3. Electronic communications, Roddy D. and Coolin J., PHI, 2006
4. Power Electronics P.C. Sen
5. Power Electronics R.M. Jalnekar& N.B. Pasalkar
6. Thyristor power Controllers, C.K Dubey, S.R. Doradla, A. Joshi & R.M. Sinha
7. Power Electronics – By M. Rashid
8. Power Electronics –J. S. Katre Technover Publication
9. Electronic Devices and Components, by J. Seymore (Longmann Scientific & Technical).
10. Integrated Electronics, by K. R. Botkar, (Khanna Publishers.)
11. Integrated Electronics: Analog and Digital Circuits Systems, by J. Millman and C. C. Halkias(Tata McGraw -Hill Publishing Company Ltd.).
12. Solid State Pulse Circuits, by David A. Bell (Prentice Hall of India Pvt. Ltd).
13. Energy Technology (Non conventional, Renewable and conventional), by S. Rao and Dr. P. B.Parrulkar (Khanna Publishers.)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 301ES	SEMESTER		3
RESEARCH METHODOLOGY				
COURSE TYPE	ELECTIVE SUBJECT	TOTAL CREDIT:	02	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
2 X 15 = 30	-	-	50 (2.0 HRS)	50

UNIT-I

What is research? Science and research, Basic and applied research, Essential steps in Research.

Literature Collection:

Need for review of literature, Review process, Research reading, Reference cards, Literature citation, Different systems.

UNIT-II

Components of Research Report/Thesis:

Field work and laboratory work, photography, Preparation of tables, Preparation of figures.

Research Report/Thesis –Formatting and Typing (Computing):

Title page, certificate, declaration, acknowledgement, list of table, figures, abbreviations and symbols, chapter quotations, table, figures, summary, appendices, references etc.

Reference Book:

1. Research Methodology with statistical pakage for social sciences Dr. A. SafeevanRao&Dr.Dipak, Tyagi, Shree Nivas Pub. -Jaypur
2. Research Methodology G.R Basotia and K.K. Sharma, Mangal Deep Jaypur
3. Research Methodology Modern methods and New techniques M.N. Borse, Shree Nivas Jaipur
4. Research Methodology Modern methods and techniques, Anil Tandon, Annol New Delhi

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 302ES	SEMESTER		3
MICROCONTROLLER				
COURSE TYPE	ELECTIVE SUBJECT	TOTAL CREDIT:	02	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
2 X 15 = 30	-	-	50 (2.0 HRS)	50

UNIT –I

The 8051 Microcontroller

Microprocessor and Microcontroller, The 8051, A Microcontroller Survey, Development System,

The 8051 Architecture: Introduction: 8051 Microcontroller hardware, Oscillator and Clock, Program counter and data pointer, A and B Register, Flag and PSW, Internal Memory and RAM, The Stack and Stack Pointer, I/P O/P Pins Ports and circuit, External Memory, TCON Register, Counter and Timers, TMOD Register, Serial Data Input/Output, IE Special Register, IP Special Register

Ref: The 8051 Microcontroller Architecture, Programming and Applications, Kenneth J Ayala, West Publication Company.

Unit – II

The AVR Microcontroller

AVR architecture and assembly language programming: The general purpose registers in the AVR, the AVR data memory, Using instructions with the data memory, AVR status register, AVR data format and directives, Introduction to AVR assembly programming, Assembling an program, The program counter and program ROM space in the AVR, RISC architecture in the AVR, Viewing registers and memory with AVR STUDIO IDE.

Ref: The AVR microcontroller and embedded system using assembly and C, Muhammad Ali Mazidi, Sarmad Naimi, and Sepehr Naimi, Prentice Hall.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
Program code :	**MSPHY**	**Program Name :**	**M.Sc PHYSICS**	
Course Code	**MSPHYPR**	**Semester :**	**3**	
PRACTICALS(PCT)				
Course type :	**Practical**	**Total credit :**	**06**	
Teaching time (hours)		**Examination Marking scheme**		
Theory (hrs)	**Practical (hrs)**	**Internal (Marks)**	**External (Marks)**	**Total (Marks)**
	12 per week		**150**	**150**

Group – I

1. Young's modulus by optical method
2. G.M. Counter
3. e/m by Helical method
4. Fiber optics
5. Microwave
6. Babinet compensator
7. Fiberless optical communication using IR
8. Microprocessor-Logical operations AND, OR, Demorgon's theorem-Proof
9. C Programming
10. C Programming

Group – II

1. Frequency Modulation and Demodulation.
2. Phase shift Oscillator using IC-741.
3. TRIAC characteristics
4. Biastable Multivibrator
5. Study of Integrator.
6. D/A and A/D Convertor.
7. Sawtooth generator using OP-AMP
8. Modulo n-counter.
9. Crystal Oscillator
10. Computer simulation

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M.Sc. (Physics) CBCS Syllabus 2019	
Document code	SYLLABUS MSPHY2019
Revision No.	00
Name of Faculty	SCIENCE
Faculty Code	SC
Program Name	MASTER OF SCIENCE (PHYSICS)
Program Code	MSPHY
Effective from	June 2019

PROGRAM : HNGU 2057

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The proposed New Course in **M.Sc. PHYSI CSPROGRAM** is based on Choice Based Credit System (CBCS) which is in force from June-2019.

CBCS Course Pattern

1. This Program is divided into **four Se mesters** (Two Years). The duration of an academic year consists of two semesters, each of **15** weeks for teaching. The academic session in each semester will provide **90** teaching days. 24 credit each semester X 4 semester=96 credits at master level.
2. There will be three categories of courses/papers in this Program:
   - **A.** **FOUR** Compulsory-Core theory courses with 4 credits each in first three semesters and Three Compulsory-Core theory courses with 4 credits each **I nSe mesterIV.**
   - **B.** **One** Choice Based Elective Course (disciplinary/interdisciplinary) with 2 credits in First Three semesters.
   - **C.** **One** Practical course (PR) with 6 credits in first three semesters.
   - **D.** **In Semester IV**, instead of practical there is a project/field work with 12 - credits.
3. Detailed Course Pattern for each Semester is given bellow.

The Proposed New Structure for M.Sc. Course is based on choice Based Credit System (CBCS) which is in force from June – 2019

M.Sc.: Semester – I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – I	Core-I	2 : 30	70	30	100	4	4
Paper – II	Core-II	2 : 30	70	30	100	4	4
Paper – III	Core-III	2 : 30	70	30	100	4	4
Paper – IV	Core-IV	2 : 30	70	30	100	4	4
Practical : Paper – I	Pract-I	3	75	--	75	6	3
Practical : Paper – II	Pract-II	3	75	--	75	6	3
Elective Course (Any One) Disciplinary/ Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Se mester –I I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – V	Core-V	2 : 30	70	30	100	4	4
Paper – VI	Core-VI	2 : 30	70	30	100	4	4
Paper – VII	Core-VII	2 : 30	70	30	100	4	4
Paper – VIII	Core-VIII	2 : 30	70	30	100	4	4
Practical : Paper – III	Pract-III	3	75	--	75	6	3
Practical : Paper – IV	Pract-IV	3	75	--	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

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M.Sc.: Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – IX	Core-IX	2 : 30	70	30	100	4	4
Paper – X	Core-X	2 : 30	70	30	100	4	4
Paper –XI	Core-XI	2 : 30	70	30	100	4	4
Paper – XII	Pract-XII	2 : 30	70	30	100	4	4
Practical : Paper – V	Pract-V	3	75	--	75	6	3
Practical : Paper –VI	Pract-VI	3	75	–	75	6	3
Elective Course (Any One) Disciplinary / Interdisciplinary		2 : 00	35	15	50	2	2
TOTAL			465	135	600	30	24

M.Sc.: Semester – IV

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teach, Hours Per week	Credit point
Paper – XIII	Core-X	2 : 30	70	30	100	4	4
Paper – IX	Core-XI	2 : 30	70	30	100	4	4
Paper – XV	Core-XII	2 : 30	70	30	100	4	4
Project	PROJECT	4	210	90	300	18	12
TOTAL			420	180	600	30	24

NOTE:

1. For 4 credit course: Each syllabus is of 4 Units having equal weightage.
2. For 2 credit course: Each syllabus is of 2 Units having equal weightage.
3. There is no section in semester end examinations i.e. questions Paper is without sections.
4. For question paper of 70 marks: Each Question paper contains 4 questions: Q-1 from unit-I of 18 marks, Q-2 from unit-II of 17 marks, Q-3 from unit-III of 18 marks and Q-4 from unit – IV of 17 marks.
5. For question paper of 35 marks: Each Question paper contains 3 questions: Q-1 from unit-I of 12 marks, Q-2 from unit-II of 12 marks, and last Q-3 is of short questions and objective types having 11 marks from unit I and unit II.

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
1	MSPHY101CC	CC	MATHEMATICAL PHYSICS-1AND"C" PROGRAMMING-1	70		30		4	100	
1	MSPHY102CC	CC	CLASSICAL MECHANICS -1 AND ELECTRODYNAMICS-1	70		30		4	100	
1	MSPHY103CC	CC	QUANTUM MECHANICS-1 AND SOLID STATE PHYSICS-1	70		30		4	100	
1	MSPHY104CC	CC	ELECTRONICS-1	70		30		4	100	
1		PRACT			150			6	150	
1	MSPHY101ES	ES	SPACE PHYSICS	35		15		2	50	Any one from Two ES PAPER
1	MSPHY102ES	ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS (ETS)	35		15		2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
2	MSPHY201ES	CC	MATHEMATICAL PHYSICS-2 AND "C" PROGRAMMING-2	70		30		4	100	
2	MSPHY202CC	CC	STATISTICAL MECHANICS-1 COMPUTOR-1	70		30		4	100	
2	MSPHY203CC	CC	QUANTUM MECHANICS-2 AND SOLID STATE PHYSICS-2	70		30		4	100	
2	MSPHY204CC	CC	ELECTRONICS-2	70		30		4	100	
2		PRACT			150			6		
2	MSPHY201ES	ES	APPLICATION OF COMPUTOR IN PHYSICS	35		15		2	50	Any one from Two ES PAPER
2	MSPHY201ES	ES	SYNTHESIS OF MATERIALS	35		15		2	50	

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Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
3	MSPHY301CC	CC	NUCLEAR PHYSICS-1 INSTRUMENTS	70		30		4	100	
3	MSPHY302CC	CC	STATISTICAL MECHANICS-2 COMPUTOR-2	70		30		4	100	
3	MSPHY303CC	CC	QUANTUM MECHANICS-3 SOLID STATE PHYSICS-3,	70		30		4	100	
3	MSPHY304CC	CC	ELECTRONICS-3	70		30		4	100	
3		PRACT			150			6	150	
3	MSPHY301ES	ES	RESEARCH METHODOLOGY	35		15		2	50	Any one from Two ES PAPER
3	MSPHY301 ES	ES	MICROCONTROLLER	35		15		2	50	

Sem	Paper Code	Paper Type	Paper Name	Marking scheme				Credit	Total	Remarks
				External		Internal				
				The	Pra	The	Pra			
4	MSPHY401CC	CC	NUCLEAR PHYSICS-2 BIO-PHYSICS	70		30		4	100	
4	MSPHY402CC	CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS-2	70		30		4	100	
4	MSPHY403CC	CC	QUANTUM MECHANICS-4 SOLID STATE PHYSICS-4,	70		30		4	100	
4		PR		210		90	-	12	300	

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PATTERN/SCHEME OF EXAMINATION

There will be examinations at the end of each semester ordinarily during November / December for odd semesters and during April/May for even semesters.

Theory Examinations:

Out of the total marks for each course/paper maximum 30% marks shall be earmarked for Internal Exam.(Through continuous internal evaluation process) and remaining 70% for External Exam. (Through semester-end examinations).

There will be one semester-end examination of two hours and thirty minutes duration for core theory papers and two hours for elective papers. Each answer script of semester end examination (theory) will be evaluated by internal as well as external examiner.

The passing marks in each paper shall be **40%.**

PRACTICAL EXAMINATION:

In the case of science faculty, there will be a practical examination at the end of every semester. There will be **TWO** Practical (one from each groups) (75Marks each for Sem.-I to Sem.-III) in the Exam. The passing marks for practical will be **40%. The practical examinations shall be conducted with one internal and one external examiner.**

In 4th Semester one minor project work there will be of 300 marks. Assessment method is given bellow.

Project Report (70 Marks): Aims & Objectives-Clearly stated and achieved? Layout, Writing style, quality of Figures, Tables, Proper organization of work etc.Use of Lib./Int./Ref.: Literature review, survey, referencing etc

Presentation (70 Marks): Way of presentation, quality of presentation, Language, clarity of speech, Method of analysis, conclusion and Recommendations, Discussion of work etc.

Viva-Voce (70 Marks): ability to answer quarries and question.

There will be no internal assessment test for practical, and Elective coursesin first three semester but in fourth semester there will be internal assessment for Project work .

INTERNAL ASSESSMENT

For each paper/course in a semester there will be Continuous internal evaluation process which includes

- Unit Test / Internal Test
- MCQ Test / QUIZ Test/Viva
- Seminar/ Poster Presentation/ Assignment work/Workshop
- Attendance - Regularity & Study Tour
- Library work -Book Review

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STRUCTURE OF THE PAPER IN EXAMINATION

For Core Courses (Disciplinary/Interdisciplinary):

There will be total four questions. First question will be from Unit - I, Second question from Unit-II, Third question from Unit-III, and fourth question will be from Unit -4. All the questions are detailed as under. **(Total 70 Marks and 2 Hours thirty minutes time for the Paper)**

1	(a) Answer the following. (Any one out of two) (Theory questions)	8 Marks
1	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
1	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
2	(a) Answer the following. (Any one out of two) (Theory questions)	7 Marks
2	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
2	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
3	(a) Answer the following. (Any one out of two) (Theory questions)	8 Marks
3	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
3	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks
4	(a) Answer the following. (Any one out of two) (Theory questions)	7 Marks
4	(b) Answer the following. (Any two out of three) (application/ Problem/ example type)	8 Marks
4	(c) Answer the following. (Any one out of two or Any Two out of three) (Short answer questions / objective type questions)	2 Marks

For Elective Courses (Disciplinary/Interdisciplinary):

There will be three questions first and second questions are of 12 marks each and third question is of 11marks. First question will be from Unit - I, Second question from Unit-II, Third question will be from both Units. All the questions are detailed as under. **(Total 35 Marks and 2 Hours' time for the Paper)**

1	(a) Answer the following (Any one out of two) (Theory questions)	6 Marks
	(b) Answer the following (Any two out of three) (short note/ application/ Problem/ example type)	6 Marks
2	(a) Answer the following (Any one out of two) (Theory questions)	6 Marks
	(b) Answer the following (Anytwo out of three) (short note/ application/ Problem/ example type)	6 Marks
3	(a) Answer any three out of five.(Short question) (b) Answer any five out of eight.(objective)	6 Marks 5 Marks

DETAILED CURRICULMSUMMARY IS GIVENIN FOLLOWING TABLE.

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
I	MSPHY-101CC	MATHEMATICAL PHYSICS -1 AND PROGRAMMING IN C-1	I	FUNCTION OF A COMPLEX VARIABLE
			II	INTEGRAL TRANSFORMS
			III	DECISION MAKING AND LOOPING & ARRAYS
			IV	CHARACTER ARRAYS AND STRINGS &FUNCTIONS
I	MSPHY-102CC	CLASSICAL MECHANICS-1 ELECTRODYNEMICS -1	I	CANONICAL TRANSFORMATION
			II	SMALL OSCILLATION AND ROTATING FRAME
			III	ELECTOMAGNETIC WAVES
			IV	POYNTING VECTOR AND THE FLOW OF POWER&GUIDED WAVES:
I	MSPHY-103CC	QUANTUM MECHANICS – ISOLID STATE PHYSICS-I	I	REPRESENTATION OF QUANTUM STATES
			II	ANGULAR MOMENTUM
			III	ENERGY BANDS
			IV	SEMICONDUCTOR CRYSTALS
I	MSPHY-104CC	ELECTRONICS-1	I	FETAMPLIFIER&MULTIVIBRATORS
			II	POWER AMPLIFIER
			III	WAVE SHAPING CIRCUIT
			IV	IC FABRICATION & TIMER 555 IC
I	MSPHY-101ES	SPACE PHYSICS	I	BASIC CONCEPTS OF EARTH'S ATMOSPHERE AND IONOSPHERE
			II	AURORA , AIRGLOW, AND MAGNETOSPHERE
I	MSPHY-102ES	ENERGY TECHNOLOGY AND STORAGE SYSTEMS	I	ENERGY TECHNOLOGY
			II	ENERGY STORAGE SYSTEMS

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
II	MSPHY-201CC	MATHEMATICAL PHYSICS -2 AND PROGRAMMING IN C-2	I	TENSOR ANALYSIS
			II	GROUP THEORY
			III	STRUCTURES AND UNIONS & POINTER
			IV	FILE MANAGEMENT IN C:&DEVELOPING A C PROGRAM
II	MSPHY-202CC	STATISTICAL MECHANICS-1 COMPUTER-1	I	BASIC CONCEPT IN STATISTICAL MECHANICS AND QUANTUM STATISTICS
			II	IDEAL BOSE AND FERMI SYSTEM
			III	WINDOWS AND POWER POINT
			IV	MICRO-SOFT WORD
II	MSPHY-203CC	QUANTUM MECHANICS–2 SOLID STATE PHYSICS-2	I	APPROXIMATION METHODS FOR STATIONARY STATES:
			II	EVOLUTION WITH TIME
			III	FERMI SURFACES AND METALS
			IV	DIAMAGNETISM AND PARAMAGNETISM
II	MSPHY-204CC	ELECTRONICS-2	I	OPERATIONAL AMPLIFIER
			II	DIGITAL ELECTRONICS
			III	MICROPROCESSOR – I
			IV	MICROPROCESSOR –II
II	MSPHY-201ES	APPLICATIONS OF COMPUTER IN PHYSICS	I	
			II	
II	MSPHY-202ES	SYNTHESIS OF MATERIAL	I	
			II	

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
III	MSPHY-301CC	NUCLEAR PHYSICS-1 AND INSTRUMENTS	I	TWO BODY FORCES
			II	NUCLEAR REACTION
			III	MICROSCOPY
			IV	UV-VIS
III	MSPHY-302CC	STATISTICAL MECHANICS-2 COMPUTER-2	I	PHASE EQUILIBRIA
			II	TRANSPORT PHENOMENA
			III	MICRO-SOFT EXCEL
			IV	COMPUTER NETWORK,INTERNET AND VIRUS
III	MSPHY-303CC	QUANTUM MECHANICS–3 SOLID STATE PHYSICS-3	I	SCATTERING THEORY
			II	PARTIAL WAVE ANALYSIS
			III	FERROMAGNETISM AND ANTI FERROMAGNETISM
			IV	MAGNETIC RESONANCE
III	MSPHY-304CC	ELECTRONICS	I	PULSE MODULATION AND DIGITAL COMMUNICATION
			II	DEMODULATION
			III	REMOTE SENSING
			IV	POWER ELECTRONICS
III	MSPHY-301ES	RESEARCH METHODOLOGY	I	
			II	
III	MSPHY-302ES	MICROCONTROLLER	I	
			II	

SEM	PAPER CODE	PAPER NAME	UNIT	TITLE OF UNIT
IV	MSPHY-401CC	NUCLEAR PHYSICS-2 AND BIO-PHYSICS	I	NUCLEAR MODEL
			II	ELEMENTARY PARTICLE
			III	SEPARATION TECHNIQUES
			IV	BIO-MECHANICS
IV	MSPHY-402CC	CLASSICAL MECHANICS-2 ELECTRODYNEMICS -2	I	NON LINEAR OSCILLATIONS AND CHAOS
			II	RELATIVISTIC ELECTRODYNAMICS
			III	WAVE GUIDE
			IV	RADIATION
IV	MSPHY-403CC	QUANTUM MECHANICS–4 SOLID STATE PHYSICS-4	I	RELATIVISTIC WAVE EQATIONS-1
			II	RELATIVISTIC WAVE EQATIONS-2
			III	OPTICAL PROCESSES AND EXCITONS
			IV	SOLAR CELL AND OPTO ELECTRONIC DEVICES
IV		PROJECT		

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PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 401 CC	SEMESTER		4
NUCLEAR PHYSICS-2 AND BIO PHYSICS				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT-I

NUCLEAR MODEL:

Single particle shell model, spin-orbit potential, analysis of shell model predictions–spinsand parities of nuclear ground states, magnetic moments, electric quadrupole moment, nuclear isomerism, stripping reactions and shell model, Collective nuclear model – rotational states and vibrational states, a brief description of Nilson model.

UNIT-II

ELEMENTARY PARTICLES:

Classification of elementary particles, type of interaction, Baryon number, lepton number, parity, charge conjugation and time reversal, CPT theorem, charge independence nuclear forces, Isospinm consequences of Isospin, G-Parity, Strange particles, associated prediction, Gell-mann Nishijima scheme, Neutral K- meson, strangeneSs, hypercharge, CP-violation in K- decay, Ispin and SU(2) and SU(3) ,Baryon and meson multiplates, Gell-mann Okubo mass formula. Quark model flavor and color

UNIT-III

Separation Techniques:

Introduction, Chromatography, Column chromatography, Thin layer chromatography, Paper chromatography, Adsorption chromatography, Partition chromatography, Gas liquid chromatography (GLC) , Ion exchange chromatography, Molecular exclusion chromatography, Affinity chromatography

Electrophoresis: Moving boundary electrophoresis, Zone electrophoresis, Low voltage electrophoresis, High voltage electrophoresis, Gel electrophoresis, Sodium dodecyl sulphate poly acrylarnide gel electrophoresis (SDS-PAGE), Iso electric focusing, Continuous flow electrophoresis.

UNIT-IV

BIOMECHANICS:

Striated Muscles, Contractile proteins, Mechanical Properties of Muscles, Contraction mechanism, Biomechanics of the Cardiovascular System, Blood pressure, Electrical activity during the heartbeat, Electrocardiography.

NEUROBIOPHYSICS:

Introduction, The Nervous System, Synapse, Moefm Mberamnberapnoetent Piaoltednutiealtso,, Voltage Clamp, S1e3n.4s.o1ry TMheevchisaunailsmresc-elTpthoer 21E8ye , Electrical activity and visual generator potentials, Optical defects of the eye, Neural aspects of vision, Visual communications, bioluminescence, Physical Aspects of Hearing, The Ear, Elementary acoustics, Theories of hearing, Signal Transduction, Mode of transport, Signal transduction in the cell.

Reference book:

1. Introduction to Nuclear physics Theory and Experimentby R.R.ROY and B.P.Nigam
2. Introduction to Nuclear physics, H.A. Enge
3. Nuclear physics by D.C.Tayal
4. Nuclear physics by Irving Kaplan
5. Introduction to nuclear physics an introduction by S.B.Patel, New Age International Publishers

6. Khanna M. P., Introduction to particle physics, PHI
7. Leon M., Particle Physics - an introduction
8. Perkins D. H., Introduction to High Energy Physics
9. Biophysics by Vasantha Pattabhi and N. Gautham, Narosa Pub.
10. Introduction to Biophysics by Pranabkumar Banerjee, S.Chand.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 402 CC	SEMESTER		4
CLASSICAL MECHANICS-2 ELECTRODYNEMICS -2				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT - I:

Non Linear Oscillations and Chaos:

Introduction, Singular Points of Trajectories, Nonlinear Oscillations, Volter's Problem, Limit cycle, Chaos, Logistic Map, Poincare System, Strange attractors

UNIT - II:

Relativistic electrodynamics:

Relativistic Mechnics, Proper Time and Proper velocity, Relativistic energy and momentum Relativistic kinematics, Relativistic dynamics, Relativistic electro dynamics, How field transform, The field tensor, Electro-dynamics in tensor notation, Relativistic potentials.

UNIT III

WAVE GUIDE:

Rectangular guides, Transverse magnetic waves in rectangular guides, Transverse electric waves in rectangular guides, Impossibility of TEM waves in wave guides, cylindrical coordinates, TM and TE waves in circular guide, Wave Impedance and Characteristic impedance

UNIT-IV

RADIATION:

Potential functions and the EM fields, potential functions for sinusoidal oscillations, oscillating electric dipole, power radiated by a current element, application to short antenna, assumed current distributions, radiations from a quarter wave monopole or half wave dipole, electromagnetic field close to an antenna, solution of the potential equations, far field approximation. Radiation- from moving charges and dipoles and retarded potentials

Reference Book:

1. Classical mechanics-A Text Book by Suresh Chandra, Narosa Publishing House New Delhi.
2. Classical Mechanics (2nd Edition), Herbert Goldstein, Addison - Wesley Publishing Co.
3. Classical Mechanics, V. B. Bhatia, Narosa Publishing house.
4. Classical Mechanics, G. Aruldhas PHI Pvt. Ltd.
5. Classical Mechanics, J. C. Upadhyaya Himalaya Publishing House.
6. E. C. Jordan and K. G. Balman, Electromagnetic waves and radiating systems, Prentice Hall of India, New Delhi, 2008
7. Handbook of Electronics by Kumar and Gupta PragatiPrakashan
8. Introduction to Electrodynamics (2nd & 3rd Edition) J. Griffiths, Prentice Hall India Ltd.
9. R. E. Collins, Antennas and Radio wave propagation, McGraw Hill Book Company, 1987
10. D. Roddy and J. Coolen, Electronic Communication, Prentice Hall, 4th edition, 1995
11. David M. Pozar, Microwave Engineering (Third Edition), Wiley- India.
12. Introduction to Electrodynamics (2nd& 3rd Edition) J. Griffiths, Prentice Hall India Ltd.
13. Electromagnetics (2nd Edition), B. B. Laud, Wiley Eastern,

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN				
PROGRAM CODE	MSPHY	PROGRAM NAME		M.SC.PHYSICS
COURSE CODE	MSPHY 403 CC	SEMESTER		4
QUANTUM MECHANICS–3 AND SOLID STATE PHYSICS-3				
COURSE TYPE	CORE COMPULSORY	TOTAL CREDIT:	04	
TEACHING TIME (HOURS)	EXAMINATION MARKING SCHEME			
THEORY (HRS)	PRACTICAL (MARKS)	INTERNAL (MARKS)	EXTERNAL (MARKS)	TOTAL (MARKS)
4 X 15 = 60	-	30	70 (2.5 HRS)	100

UNIT - I:

RELATIVISTIC WAVE EQATIONS-1:

Generalization of the Schrodinger equation, The Klein-Gordan equation: Plane wave Solutions, Charge and Current Densities, Interaction with electromagnetic fields; Hydrogen-like atom, Non relativistic limit, Dirac s relativistic Hamiltonian, position probability density; expectation values, Dirac matrices, plane wave solutions of the Dirac equation; energy spectrum, the spin of the Dirac particle; Dirac particle in electromagnetic fields,

UNIT - II:

RELATIVISTIC WAVE EQATIONS-2:

Relativistic electron in a central potential; total angular momentum, Radial wave equation in coulomb potential, Series solutions of the radial equations:Asymptotic behavior, determination of the energy levels, Exact radial wave functions, comparision to non relativistic case, electron in magnetic field, spin magnetic moment. The spin orbit energy.

UNIT-III

OPTICAL PROCESSES AND EXCITONS:

Optical Reflectance, Kramers-Kroning Relations, Mathematical note, conductivity of collisionless electron gas, electronic interband Transitions, Excitons: frenkel excitons, Alkali Halides, Molecular Crystals, Weakly bound excitons, Exciton condensation into Electron-Hole Drops (EHD), Raman effects in crystals, Electron Spectroscopy with X-rays, Energy Loss of Fast Particles in a solid.

UNIT – IV

SOLAR CELL

Configuration of a solar PV systems, PV cell technology, Structures of solar cells-M-S solar cells, MIS solar cells, solid–liquid junction solar cells, comparison of p-n junction, Schottky junction, M-S, M-I-S solar cells.

Optoelectronic Devices:

Sources: LED: Introduction, Radiative transitions, Emission spectra, Methods of excitations, LED-Structures; Materials for choice, Definition of efficiencies,

Detectors: Introduction, Photoconductor, Photodiodes, p-i-n & p-n photodiodes, Avalanche photodiode, Phototransistor,

Reference Books :

1. A textbook of quantum mechanics P M Mathews and K V Venkatesan McGrawhill Education
2. Quantum Mechanics by L. I. Schiff, McGraw-Hill International student edition (1961).
3. Introduction to Quantum Mechanics by Powell and Crasemann Addison-Wesley (1961).
4. Quantum Mechanics by V.K. Thankappen, Wiely eastern Ltd.
5. Quantum Mechanics : Theory and applications by A. Ghatak and S. Lokanathan.
6. Quantum Mechanics by H.C.Verma
7. Quantum Mechanics by K.K. Chopra & G.C.Agarwal, Krishna Prakashan Media, (P)LTD.MEERUT
8. Introduction to Solid State Physics. Charles Kittel 7th Edition.

9. Introduction to Solid State Physics. J P Srivastava 4th Edition.
10. Solid State Physics by S.O.Pillai, New age international publishers
11. Fundamental of Solid State Physics by Saxena, Gupta and Kumar Pragati Prakashan

HEMCHANDRACHARYANORTH GUJARAT UNIVERSITY, PATAN
M.Sc. (PHYSICS): SEMESTER-IV

PROJECT WORK

- PROJECT REPORT
- PROJECT PRESENTATION
- VIVA

CHAIRMAN
Board of Studies

HEMCHANDRACHRAYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN – 384265

Faculty of Science

Revised M.Sc. Chemistry Syllabus

Semester – 1

PROGRAM : HNGU 2058

W.E.F. June -2019 (and thereafter)

DATE : 25/09/2019

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CURRICULUM
Hemchandracharya
North Gujarat University,Patan.
M.Sc. (Chemistry) (WEF June: 2019)General Information of Semester I &II
Syllabus According To CBCS Pattern

1. The medium of instruction, question papers as well as answers in examinations will be Englishonly.
2. Passing standard: 40% As per the revised rules and regulation of Hemchandracharya North Gujarat University, Patan. (Aca/Axs/744/2018, Date 27/4/2018).
3. Viva voce will be pertaining topracticals.
4. ThedegreewillbeawardedinM.Sc.(Chemistry)inspecializedbranch. The curriculum will be common for semester – I & semester – II for all branches.
5. The result sheet of all semesters will contain the name of elective papers selected by the candidate, the grade and the creditsecured.
6. A maximum of 10% students passing second semester may be allowed for dissertation at the 4th semester. Such students will be exempted from practical as well as viva of fourth semester, in lieu of that the dissertation of candidate will be assessedwith100marksofdissertationand50marksofthevivaofdissertation.

   If the number of students willing to opt dissertation exceeds 10%, dissertation will be given on the basis of merit of combined marks of first and second semester. The dissertation will be allotted to the students in the beginning of third semester by head of the department/ P.G. Center.
7. Intake of students every center 25 (organic branch) 15 for Inorganic & physical branch,UniversityDepartment.55(Inorganic,OrganicandPhysicalbranches)

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8. For semester, I &II

The internal evaluation for total 120 marks will be done as per the continuous evaluation process as under.

	Marks
a) Weekly test of theory(minimum8)	56
b) Internal Practical examination (onceasemester)	20
c) Students seminar (OnceaSemester)	14
d) Problem Solving /NewPractical	06
e) Bookreview(Instudentsownhandwriting,separatebookforall)	07
f) Project work assessment (separateforall)	07
g) Quiz/Questionnaire	10
Total	120

9. A batch of ChemistryPractical will consist of 20 students per teacher. 120 + 15 = 135 Paper-5

10. For semester I, the paper, CHNN-401, CHNN-402, CHNN-403, CHNN-404 are compulsory. Furthermore, students will have choice to select any one of CHNN-405 A, CHNN-405B, or CHNN – 405C.

11. For semester II, the papers, CHNN-501, CHNN-502, CHNN-503, and CHNN-504 are compulsory. In addition, the student has a choice to select either CHNN-505 A or CHNN-505B.

12. For all the semesters, the total marks will be given out of 600. The cumulative grade will be as per universityrules.

Note: During the preparation of this curriculum, ample care is taken for consideration of the followings:

A. Model curriculum ofU.G.C.
B. Concept of continuousevaluation
C. CGPA (Cumulative Grade Point AverageCredit)
D. CBCS (Choice Based CreditSystem)
E. Semesterapproach
F. Revised rules and regulation of Hemchandracharya North Gujarat University,Patan.
G. NET (NATIONAL ELIGIBILITY TEST)curriculum

13. As per recent directive from university, all the 4 credit as well as 2 credit courses will have internal marks as indicated in the table.

14. For university Examination for each batch, maximum – 30 students / three examiners / 3days.

15. The mark distribution of 150 marks of practicals will be as under from – (CHNN-406 + CHNN-407) – M.Sc. Sem-I

Inorganic Chemistry : 40 + 10 Viva (One full day)

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Organic Chemistry : 40 + 10 Viva (One full day)

Physical Chemistry : 40 + 10 Viva (One full day)

Total : 150 Marks

For M.Sc. Sem – II the distribution of 150 marks will also follow similar pattern and the exercises will be from CHNN – 506 + CHNN – 507.

OnedayeachforInorganic,OrganicandPhysicalchemistrybranch,Markswillbe 50 from each branch and hence total practical marks will be 150 (including viva), for CHNN- 406 and CHNN-407 for semester I. Similar pattern will be for MSc. semesterII.

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M.Sc. (Chemistry) (WEF June: 2019)
Semester End Examination
Semester – I

Work Load	Paper No.	Subject	External Marks	Internal Marks	Credit
60 Hrs.	CHNN-401	Inorganic Chemistry	70	30	4
60 Hrs.	CHNN-402	Organic Chemistry	70	30	4
60 Hrs.	CHNN-403	Physical Chemistry	70	30	4
60 Hrs.	CHNN-404	Symmetry, GroupTheory& Spectroscopy	70	30	4
30 Hrs	CHNN-405 A	Computers for Chemists	35	15	2
30 Hrs	CHNN-405 B	Computational Chemistry	35	15	2
30 Hrs	CHNN-405 C	Organic Spectroscopy	35	15	2
90 Hrs.	CHNN-406	Practical I	-----	-----	3
90 Hrs.	CHNN-407	Practical II	-----	-----	3
Total			465	135	24

*EachCHNN-406andCHNN–407includes30marksofvivainthetotalof150marksof viva voceexamination. (Details as shown in 15.)

Working per semester minimum 90 days (15weeks)

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M.Sc. (Chemistry) Semester – 1

Course: CHNN – 401 (Core compulsory)

Inorganic Chemistry

I Stereochemistry and Bonding in MainGroupCompounds **12 Hrs**

VSEPR, Walsh diagrams (tri- and penta- atomic molecules), d-p,I bonds, Bent rule and energetics of hybridization, some simple reactions of covalently bondedmolecules.

II Metal-Ligand EquilibriainSolution **8Hrs**

Stepwise and overall formation constants and their interaction, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect and its thermodynamic origin, determination of binary formation constants by pH - metry and spectrophotometry.

III Reaction Mechanism of TransitionMetalComplexes **24Hrs**

Energy profile of a reaction, reactivity of metal complexes, inert and labile complexes, kinetic application of valence bond and crystal field theories, kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism, anation reactions, reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes, the trans effect, mechanism of the subtitution reaction. Redox reactions, electron transfer reactions, mechanism of one electron transfer reactions, outer-sphere type reactions, cross reactions and Marcus-Hush theory, inner sphere type reactions.

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IV Metal-LigandBonding **16Hrs**

Limitation of crystal field theory, molecular orbital theory, octahedral, tetrahedral and square planar complexes, n-bonding and molecular orbital theory.

Books Suggested

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, JohnWiley.

2. Inorganic Chemistry, J.E. Huhey,Harpes&Row.~

3. Chemistry of the Elements,vN.N. Greenwood and A. Earnshow,Pergamon.

4. Inorganic Electronic Spectroscopy, A.B.P. Lever,Elsevier.

5. Magnetochemistry, FI.L. Carlin, SpringerVerlag.

6. ComprehensiveCoordinationChemistryeds.,G. Wilkinson,FLD.GillarsandJ.A McCleverty,Pergamon.

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M.Sc. (Chemistry) Semester - 1

Course:CHNN–402(Corecompulsory)

Organic Chemistry

I Nature of Bonding inOrganicMolecules **10Hrs**

Delocalized chemical bonding—conjugation, cross conjugation, resonance, hyperconjugation, bonding in fullerenes, tautomerism.

Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, Huckel's rule, energy level of pi-molecular orbitals, annulenes, anti— aromaticity, homo-aromaticity, PMO approach.

Bonds weaker than covalent- addition compounds, crown ether complexes and cryptands, inclusion compounds, cyclodextrins, catenanes and rotaxanes.

II Stereochemistry **15Hrs**

Conformational analysis of cycloalkanes, decalins, effect of conformation on reactivity, conformation of sugars, steric strain due to unavoidable crowding.

Elements of symmetry, chirality, molecules with more than one chiral center, threo and erythro isomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and stereoselective synthesis. Asymmetric synthesis. Optical activity in the absence of chiral carbon (biphenyls, allenes and spiranes), chirality due to helical shape.

Stereochemistry of the compounds containing nitrogen, sulphur and phosphorus.

III Reaction Mechanism: StructureandReactivity **12Hrs**

Types of mechanisms, types of reactions, thermodynamic and kinetic requirements, kinetic and thermodynamic control, Hammond's postulate, Curtin-Hammett principle.

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Potential energy diagrams, transition states and intermediates, methods of determining mechanisms, isotope effects. Hard and soft acids and bases.

Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, Benzyne, carbenes and nitrenes.

Effect of structure on reactivity - resonance and field effects, steric effect, quantitative treatment. The Hammett equation and linear free energy relationship, substituent and reaction constants. Taft equation.

IV (A) AliphaticNucleophilicSubstitution **15Hrs**

The SN2, SN1, mixed SN1 and SN2 and SET mechanisms.

The neighbouring group mechanism, neighbouring group participation by Pi and sigma bonds, anchimeric assistance.

Classical and nonclassical carbocations, phenonium ions, norbornyl system, common carbocation rearrangements. Application of NMR spectroscopy in the detection of carbocations.

The SNi mechanism.

Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon.

Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium, phase transfer catalysis and ultrasound, ambidentnucleOphile, regioselectivity.

(B) FreeRadicalReactions **8Hrs**

Types of free radical reactions, free radical substitution mechanism, mechanism at an aromatic substrate, neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehead. Reactvity in the attacking radicals. The effect of solvents on reactivity.

Allylic halogenation (NBS), oxidation of aldehydes to carboxylic acids, auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts. Sandmeyer reaction. Free radical rearrangement. Hunsdiecker reaction.

Books Suggested

1. AdvancedOrganicChemistry-Reactions,MechanismandStructure,JerryMarch,John Wiley.
2. Advanced Organic Chemistry, F. A. Carey and R. J. Sundberg,Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes,Longman.
4. Structure and Mechanism in Organic Chemistry, C. K. Ingold, Cornell UniversityPress.
5. Organic Chemistry, R. T. Morrison and R. N. Boyd,Prentice-Hall.
6. Modern Organic Reactions, H. O. House,Benjamin.
7. PrinciplesofOrganic Synthesis,R.O.C.NormanandJ.M.Coxon,BlackieAcademic& Professional.
8. Pericyclic Reactions, S. M. Mukherji, Macmillan,India.
9. Reaction Mechanism in Organic Chemistry, S. M. Mukherji and S. P. Singh,Macmillan.
10. Stereochemistry of Organic Compounds, D. Nasipuri, New AgeInternational.
11. Stereochemistry of Organic Compounds, P.S. Kalsi, New AgeInternational.

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M.Sc. (Chemistry) Semester - 1

Course:CHNN–403(Corecompulsory)

Physical Chemistry

Unit-I (A)QuantumChemistry **15Hrs**

Introduction to Exact Quantum MechanicalResults

The Schrodinger equation and the postulates of quantum mechanics. Discussion of solutionsoftheSchrodingerequationtosomemodelsystemsviz.,particleinabox,the harmonic oscillator, the rigid rotor, the hydrogenatom.

(B) Approximate Methods

The variation theorem, linear variation principle. Perturbation theory (first order and non-degenerate). Applications of variation method and perturbation theory to the Helium atom.

Unit-II –(A)AngularMomentum **15Hrs**

Ordinaryangularmomentum,generalizedangularmomentum,eigenfunctionsforangular momentum, eigenvalues of angular momentum, operator using ladder operators, addition of angular momenta, spin, antisymmetry and Pauli exclusionprinciple.

(B) Electronic Structure ofAtoms

Electronic configuration, Russell-Saunders terms and coupling schemes, Slater-Condon parameters, term separation energies of the pn configuration, term separation energies for the dn configurations, magnetic effects: spin-orbit coupling and Zeeman splitting, introduction to the methods of self -consistent field, the virial theorem.

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(C) Molecular OrbitalTheory

Huckel theory of conjugated systems, bond order and charge density calculations. Applications to ethylene, butadiene, cyclopropenyl radical, cyclobutadiene etc. Introduction to extended Huckel theory.

Unit-IIIThermodynamics

Classical Thermodynamics **15Hrs**

Brief resume of concepts of laws of thermodynamics, free energy, chemical potential and entropies. Partial molar properties; partial molar free energy, partial molar volume and partial molar heat content and their significances. Determinations of these quantities. Concept of fugacity and determination of fugacity.

Non-ideal systems: Excess functions for non-ideal solutions. Activity, activity coefficient, Debye—Huckel theory for activity coefficient of electrolytic solutions; determination of activity and activity coefficients; ionic strength.

Application of phase rule to three component systems; second order phase transitions.

Unit-IV (A)StatisticalThermodynamics **15Hrs**

Concept of distribution, thermodynamic probability and most probable distribution. Ensemble averaging, postulates of ensemble averaging. Canonical, grand canonical and microcanonical ensembles, corresponding distribution laws (using Lagrange's methdd of undetermined multipliers).

Partition functions - translational, rotational, vibrational and electronic partition functions, calculation of thermodynamic properties in terms of partition functions. Applications of partition functions.

Heat capacity behaviour of solids — chemical equilibria and equilibrium constant in terms of partition functions, Fermi-Dirac statistics, distribution law and applications to metal. Bose—Einstein statistics — distribution law and application to helium.

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(B) Non-Equilibrium Thermodynamics

Thermodynamic criteria for non-equilibrium states, entropy production and entropy flow, entropy balance equations for different irreversible processes (e.g., heat flow, chemical reaction etc.) transformations of the generalized fluxes and forces, non equilibrium stationary states, phenomenological equations, microscomc reversibility and Onsager's reciprocity relations, electrokinetic phenomena, diffusion, electric conduction, irreversible thermodynamics for biological systems, coupled reactions.

Books Suggested

1. Physical Chemistry, P.W. Atkins,ELBS.
2. Introduction to Quantum Chemistry, A.K. Chandra, Tata McGrawHill.
3. Quantum Chemistry, Ira N. Levine, PrenticeHall.
4. Coulson's Valence, R. McWeeny,ELBS.
5. Chemical Kinetics, K. J. Laidler, Mcgraw-Hill.
6. KineticsandMechanismofChemicalTransformations,J.RajaramanandJ.Kuriacose, McMillan.
7. Micelles, Theoretical and Applied Aspects, V. Moroi,Plenun
8. Modern Electrochemistry Vol. I and Vol. II, J.O.M. Bockris and A.K.N. Fteddy,Plenum.
9. IntroductiontoPolymerScience,V.Fl.Gowarikar,N.V.VishwanathanandJ.Sridhar, WileyEastern.

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M.Sc. (Chemistry) Semester - 1

Course:CHNN–404(Corecompulsory)

Symmetry, Group Theory & Spectroscopy

UNIT-01 Symmetry & Group Theory

16 Hrs

- Outline of symmetry elements and symmetry operation
- Schonflies method for determining the point group of the molecules.
- Multiplication of symmetry operation and multiplication table for C_2v, C_3v, C_{2h}.
- Equivalent symmetry elements, similarity transformation and conjugacy of symmetry operation within the point group
- Matrics: Characteristics,types of matrices(common & special),and Algebra of matrices(Particularly Multiplication)
  Use of Matrix and matrix representation of symmetryElements and Their point groups(using variousVectors: position vector, translation vector, base vector)
- Γ_{3N} Representation :For H_2O,NH_3,BF_3,$PtCl_4$,PCl_5,SF_6,$POCl_3$,CCl_4,Cis &Trans N_2F_4. $XeOF_4$
- Reducible and Irreducible Representation& charactor Table
- Characteristics of Irreducible Representation: The great orthogonality theorem
- Construction of Character Table For C_3v using properties of irreducible Representation
- Direct product and its utility.

UNIT 02 : Group theory and its applications

16 Hrs

- Character table and their presentation
- Reduction formula for reducible representation of any matrix presentation of particular point groups
- Application of symmetry to hybrid orbital, molecular orbital
- Hybridisation schemes for sigma-orbitals (for AB_3 : planar triangle, trigonal pyramidal e.g. BF_3 & NH_3 , AB_4 : tetrahedral and square planar molecules e.g. CH_4& $[PtCl_4]^{-2}$, AB_5 : trigonal bipyramidal & square pyramidal e.g. PCl_5 & IF_5 and AB_6 : octahedral e.g. SF_6 and pi-orbital for AB_3 (e.g. BF_3) AB_6 (e.g. SF_6)
- Application of symmetry to molecular vibrations, interpretation of IR & Raman activity. (spectral data)

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15.

UNIT 03 : Unifying principles of spectroscopy. **15 Hrs**

Electromagnetic radiation, interaction of electromagnetic radiation with matter absorption,emission,transmission,reflection,refraction,polarisation and scattering, Uncertainty relation and natural line width and natural line broadening, transition probability, results of the time dependent perturbation theory ,transition moment, selection rules, intensity of spectral lines, Born-Oppenheimer approximation, rotational, vibrational, and electronic energy levels.

UNIT 04 : Mossbauer spectroscopy **13 Hrs**

- Introduction
- Interpretation of isomer shifts
- Quadruped interactions
- Paramagnetic Mossbauer Spectra
- Mossbauer Emission Spectroscopy
- Application 5

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M.Sc. (Chemistry) Semester - 1

Course:CHNN–405(A)(Electivecourse)
Computers for Chemists

CHNN -405 (A) ComputersforChemists **30 Hrs (2Hrs/week)**

This is a theory-cum-laboratory course with more emphasis on laboratory work.

I Introduction to ComputersandComputing **8Hrs**

Basic structure and functioning of computers with a PC as an illustrative example. Memory, I/O devices. Secondary storage. Computer languages. Operating systems with DOS as an example. Introduction to UNIX and WINDOWS. Data-Processing, principles of programming. Algorithms and flow-charts.

II Computer ProgramminginFORTRAN/C/BASIC **10Hrs**

(The language features are listed here with reference to FORTRAN. The instructor may choose another language such as BASIC or C and the features may be replaced appropriately). Elements of the computer language. Constants and variables. Operations and symbols. Expressions. Arithmatic assignment statement. Input and Output. Format statement. Termination statements. Branching statements such as IF or GO TO statement. LOGICAL variables. Double precision variables. Subscripted variables and DIMENSION. DO statement. FUNCTION and SUBFIOUTINE. COMMON and DATA statements. (Students learn the programming logic and these language features by 'hands on' experience on a personal computer from the very beginning of this topic).

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III ProgramminginChemistry **12Hrs**

Developmentofsmallcomputercodesinvolvingsimpleformulaeinchemistry,suchasvan der Waals equation, pH titration, kinetics, radioactive decay. Evaluation of lattice energy and ionic radii from experimental data. Linear simultaneous equations to solve secular equations within the Huckel theory. Elementary structural features such as bond lengths, bond angles, dihedral angles etc. of molecules extracted from a database such as Cambridge database.

Books Suggested

1. Computers and Common Sense, R. Hunt and J. Shelley, PrenticeHall.
2. Computational Chemistry, A.C. Norris.
3. Microcomputer Quantum Mechanics, J.P. Killngbeck, AdamHilger.
4. Computer Programming in FORTRAN IV, V. Rajaraman, PrenticeHall.
5. An Introduction to Digital Computer Design, V. Rajaraman and T. Radhakrishnan, Prentice Hall.

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M.Sc. (Chemistry) Semester - 1

Course:CHNN–405(B)(Electivecourse)

Computational Chemistry

I Fortran/C Programming andNumericalMethods **15 Hrs**

Advanced programming features of FORTRAN/C. Basic theory, discussion of algorithms and errors for the following numerical methods. Examples from chemistry should be selected for illustrating the methods. The teacher may select ANY THREE of the following subtopics coiisidering the background of students, available time etc.

a. Solution of Equations

Bisection, regular falsi, Newton ~Fiaphson and related methods for solving polynomial and transcendental equations. Convergence. Errors and ill-conditioning.

b. Linear SimultaneousEquations

Gaussian elimination, Gauss -Seidel method, Gauss-Jordan method. Pivoting strategy. Errors and ill conditioning.

c. Eigenvalues and MatrixDiagonalization

Jacobi and Householder methods, analysis or errors.

d. Interpolation

Newton forward and backward difference, central differenced formulae. Lagrange and Hermite interpolation. Polynomial wiggle problem.

e. NumericalDifferentiation

Soiution of simple differential equations by Taylor series and Runge-Kutta methods.

f. NumericalIntegration

Newton-Cotes formulae, Romberg integration, errors in integration formulae.

The students should develop computer programs for some of the above numericalmethods.

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II Running of AdvancedScientificPackages **15 Hrs**

The students are expected to get hands on experience of running a few selected advanced level scientific software packages after a brief introduction to the basictheory and methodology. ab initio quantum chemical packages such as GAUSSIAN/GAMES with carefully designed exercises for illustrating various features of the packages.

Books Suggested

1. The Chemistry Mathematics Book, E. Steiner, Oxford UniversityPress.
2. Mathematics for Chemistry, Doggett and Sublifte, Longman.
3. Mathematical Preparation for Physical Chemistry, F. Daniels, McGrawHill.
4. Chemical Mathematics, D.M. Hirst,Longman.
5. Applied Mathematics for Physical Chemistry, JR. Barrante, PrenticeHall.
6. Basic Mathematics for Chemists, Tebbutt,Wiley.

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M.Sc. (Chemistry) Semester - 1

Course:CHNN–405(C)(Electivecourse)

Organic Spectroscopy

Unit – 1 : ^{13}C-NMR Spectroscopy

Introduction, Chemical Shift, Splitting of Signal, CMR Spectrum of Some Important Compounds Examples

Unit – 2 : MASS Spectroscopy

Basic Principle, Instrumentation and Applications of Mass Spectroscopy. IONIZATION METHODS, MOLECULAR ION PEAK (MIP), BASE PEAK, Isotope Abundance, ISOTOPE PAEAK METASTABLE ION PAK, FRAGMENTATION, Mass Spectrum of Some Important Compounds.

Unit – 3 : Problems Based on UV, IR, NMR and Mass Spectroscopy

REFERENCES

- Organic Chemistry by Morrison & Boyd
- Organic Spectroscopy by William Kemp
- Spectroscopic Techniques for Organic Chemists by James W. Cooper
- Spectroscopy of Organic Compounds by P. S. Kalsi
- Organic Structural Spectroscopy by Lambert, Sharvell, Lightner & Cooks
- Spetrometric Identification of Orgnaic Compounds by Silverstein and Webster
- Organic Spectroscopy by V. R., Dani

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M.Sc. SEM – 1

Practical I

CHNN – 406 (Inorganic + Organic)

Qualitative and Quantitative Analysis

A. Lesscommonmetalions—Tl,Mo,W, Ti,Zr,Th,V,U(twometalionsincationic/anionic forms)

B. Insolubles - oxides, sulphates andhalides

Books Suggested

1. VogelsTextbookofQuantitativeAnalysis,revised,J.Bassett,R.C.Denney,G.H. Jeffery and J.Mendham,ELBS
2. Synthesis and Characterization of inorganic Compounds, W. L. Jolly, PrenticeHall
3. ExperimentsandTechniquesinOrganicChemistry,D.Pasto,C.JohnsonandM.Miller, Prentice Hall
4. Macroscale and Microscale Organic Experiments, K. L. Williamson, D. C.Heath.
5. Systematic Qualitative Organic Analysis, H. Middleton, AdwardArnold.
6. Handbook of Organic Analysis- Qualitative and Quantitative, H. Clark, AdwardArnold.
7. Vogel's Textbook of Practical Organic Chemistry, A. Ft. Tatchell, JohnWiley
8. Practical Physical Chemistry, A. M. James and F. E. Prichard,Longman
9. Findley's Practical Physical Chemistry, B. P. Levitt,Longman
10. Experimental Physical Chemistry, RC. Das and B. Behera, Tata McGrawHill.

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Organic Synthesis

Acetylation: Acetylation of cholesterol and separation of cholesteryl acetate by column chromatography

Oxidation: Adipic acid by chromic acid oxidation of cyclohexanol

Grignard reaction: Synthesis of triphenylmethanol from benzoic acid

Aldol condensation: Dibenzal acetone from benzaldehyde

Sandmeyer reaction: p-Chlorotoluene from p-toluidine

Acetoacetic ester Condensation: Synthesis of ethyl-n-butylacetoacetate by A.E.E. condensation.

Cannizzaro reaction: 4—Chlorobenzaldehyde as substrate

Friedel Crafts Reaction: B-Benzoyl pr0pionic acid from succinic anhydride and benzene

Aromatic electrophilic sustitutions: Synthesis of p-nitroaniline and p-bromoaniline

The Products may be Characterized by Spectral other Techniques

Quantitative Analysis

Determination of the percentage or number of hydroxyl groups in an organic compound by acetylation method

Estimation of amines/phenols using bromate bromide solution/or acetylation method

Determination of Iodine and Saponification values of an oil sample.

Determination of COD of water sample

Books Suggested

1. VogelsTextbookofQuantitativeAnalysis,revised,J.Bassett,R.C.Denney,G.H. Jeffery and J.Mendham,ELBS
2. Synthesis and Characterization of inorganic Compounds, W. L. Jolly, PrenticeHall
3. ExperimentsandTechniquesinOrganicChemistry,D.Pasto,C.JohnsonandM.Miller, Prentice Hall
4. Macroscale and Microscale Organic Experiments, K. L. Williamson, D. C.Heath.
5. Systematic Qualitative Organic Analysis, H. Middleton, AdwardArnold.
6. Handbook of Organic Analysis- Qualitative and Quantitative, H. Clark, AdwardArnold.
7. Vogel's Textbook of Practical Organic Chemistry, A. Ft. Tatchell, JohnWiley
8. Practical Physical Chemistry, A. M. James and F. E. Prichard,Longman
9. Findley's Practical Physical Chemistry, B. P. Levitt,Longman
10. Experimental Physical Chemistry, RC. Das and B. Behera, Tata McGrawHill.

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SEM – I

Practical - II

CHNN – 407Physical Chemistry

Error Analysis and Statistical Data Analysis

Errors, types of errors, minimization of errors, error distribution curves, precision, accuracy and combination; statistical treatment for error analysis, student 't' test, null hypothesis, rejection criteria, F & Q test; linear regression analysis, curve fitting.

Calibration of volumetric apparatus, burette, pipette and standard flask.

Adsorption

To study surface tension - concentration relationship for solutions (Gibbs equation).

Phase Equilibria

(i) Determinationofcongruentcompositionandtemperatureofabinarysystem(e.g., Diphenylaminen - benzophenonesystem)

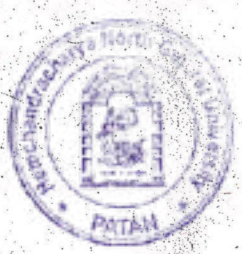
(ii) Determination of glass transition temperature of a given salt (e.g.,CaCl2) conductometrically.

(iii) Toconstructthephasediagramforthreecomponentsystem(e.g.,chloroform—acetic Acid -water).

Chemical Kinetics

(i) Determinationoftheeffectof(a)Changeoftemperature (b)Changeofconcentrationof reactants and catalyst and (c) Ionic strength of the media on the velocity constant of hydrolysis of an ester/ionicreactions.

(ii) Determinationofthevelocityconstantofhydrolysisofanester/ionicreactioninmicellar Media



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Electrochemistry

A. Conductometry

(i) Determinationofthevelocityconstant,orderofthereactionandenergyofactivationfor saponification of ethyl acetate by sodium hydroxideconductometrically.

(ii) Determinationofsolubilityandsolubilityproductofsparinglysolublesalts(e.g.,PbSO4, BaSO4)conductometrically.

(iii) Determination of the strength of strong and weak acids in a givenmixture conductometrically.

Potentiometry/pH metry

I) Determinationofstrengthsofhalidesinamixturepotentiometrically.

II) Determination of the valency of mercurous ionspotentiometrically.

Polarimetry

(i) Determinationofrateconstantforhydrolysis/inversionofsugarusingapolarimeter.

(ii)Enzyme kinetics - inversion ofsucrose

Books Suggested

1. VogelsTextbookofQuantitativeAnalysis,revised,J.Bassett,R.C.Denney,G.H. Jeffery and J.Mendham,ELBS
2. Synthesis and Characterization of inorganic Compounds, W. L. Jolly, PrenticeHall
3. ExperimentsandTechniquesinOrganicChemistry,D.Pasto,C.JohnsonandM.Miller, Prentice Hall
4. Macroscale and Microscale Organic Experiments, K. L. Williamson, D. C.Heath.
5. Systematic Qualitative Organic Analysis, H. Middleton, AdwardArnold.
6. Handbook of Organic Analysis- Qualitative and Quantitative, H. Clark, AdwardArnold.
7. Vogel's Textbook of Practical Organic Chemistry, A. Ft. Tatchell, JohnWiley
8. Practical Physical Chemistry, A. M. James and F. E. Prichard,Longman
9. Findley's Practical Physical Chemistry, B. P. Levitt,Longman
10. Experimental Physical Chemistry, RC. Das and B. Behera, Tata McGrawHill.

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HEMCHANDRACHRAYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN – 384265

Faculty of Science

Revised M.Sc. Chemistry Syllabus

Semester – 2

PROGRAM : HNGU 2058

W.E.F. June -2019 (and thereafter)

DATE : 25/09/2019

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CURRICULUM
Hemchandracharya
North Gujarat University,Patan.
M.Sc. (Chemistry) (WEF June: 2019)General Information of Semester I &II
Syllabus According To CBCS Pattern

1. The medium of instruction, question papers as well as answers in examinations will be Englishonly.
2. Passing standard: 40% As per the revised rules and regulation of Hemchandracharya North Gujarat University, Patan. (Aca/Axs/744/2018, Date 27/4/2018).
3. Viva voce will be pertaining topracticals.
4. ThedegreewillbeawardedinM.Sc.(Chemistry)inspecializedbranch. The curriculum will be common for semester – I & semester – II for all branches.
5. The result sheet of all semesters will contain the name of elective papers selected by the candidate, the grade and the creditsecured.
6. A maximum of 10% students passing second semester may be allowed for dissertation at the 4th semester. Such students will be exempted from practical as well as viva of fourth semester, in lieu of that the dissertation of candidate will be assessedwith100marksofdissertationand50marksofthevivaofdissertation.

   If the number of students willing to opt dissertation exceeds 10%, dissertation will be given on the basis of merit of combined marks of first and second semester. The dissertation will be allotted to the students in the beginning of third semester by head of the department/ P.G. Center.
7. Intake of students every center 25 (organic branch) 15 for Inorganic & physical branch,UniversityDepartment.55(Inorganic,OrganicandPhysicalbranches)

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8. For semester, I &II

The internal evaluation for total 120 marks will be done as per the continuous evaluation process as under.

	Marks
a) Weekly test of theory(minimum8)	56
b) Internal Practical examination (onceasemester)	20
c) Students seminar (OnceaSemester)	14
d) Problem Solving /NewPractical	06
e) Bookreview(Instudentsownhandwriting,separatebookforall)	07
f) Project work assessment (separateforall)	07
g) Quiz/Questionnaire	10
Total	120

9. A batch of ChemistryPractical will consist of 20 students per teacher. + 15 Paper-5 = 135

10. For semester I, the paper, CHNN-401, CHNN-402, CHNN-403, CHNN-404 are compulsory. Furthermore, students will have choice to select any one of CHNN-405 A, CHNN-405B, or CHNN – 405C.

11. For semester II, the papers, CHNN-501, CHNN-502, CHNN-503, and CHNN-504 are compulsory. In addition, the student has a choice to select either CHNN-505 A or CHNN-505B.

12. For all the semesters, the total marks will be given out of 600. The cumulative grade will be as per universityrules.

Note: During the preparation of this curriculum, ample care is taken for consideration of the followings:

A. Model curriculum ofU.G.C.
B. Concept of continuousevaluation
C. CGPA (Cumulative Grade Point AverageCredit)
D. CBCS (Choice Based CreditSystem)
E. Semesterapproach
F. Revised rules and regulation of Hemchandracharya North Gujarat University,Patan.
G. NET (NATIONAL ELIGIBILITY TEST)curriculum

13. As per recent directive from university, all the 4 credit as well as 2 credit courses will have internal marks as indicated in the table.

14. For university Examination for each batch, maximum – 30 students / three examiners / 3days.

15. The mark distribution of 150 marks of practicals will be as under from – (CHNN-406 + CHNN-407) – M.Sc. Sem-I

Inorganic Chemistry : 40 + 10 Viva (One full day)

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Organic Chemistry : 40 + 10 Viva (One full day)

Physical Chemistry : 40 + 10 Viva (One full day)

Total : 150 Marks

For M.Sc. Sem – II the distribution of 150 marks will also follow similar pattern and the exercises will be from CHNN – 506 + CHNN – 507.

OnedayeachforInorganic,OrganicandPhysicalchemistrybranch,Markswillbe 50 from each branch and hence total practical marks will be 150 (including viva), for CHNN- 406 and CHNN-407 for semester I. Similar pattern will be for MSc. semesterII.

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M.Sc. (Chemistry) (WEF June: 2019)
Semester End Examination
Semester - II

Work Load	Paper No.	Subject	External Marks	Internal Marks	Credit
60 Hrs.	CHNN-501	Inorganic Chemistry	70	30	4
60 Hrs.	CHNN-502	Organic Chemistry	70	30	4
60 Hrs.	CHNN-503	Physical Chemistry	70	30	4
60 Hrs.	CHNN-504	Spectroscopy – part II	70	30	4
30 Hrs	CHNN-505 A	Organotransition MetalChemistry	35	15	2
30 Hrs	CHNN-505 B	Bioinorganic and SupramolecularChemistry.	35	15	2
90 Hrs.	CHNN-506	Practical I	-----	-----	3
90 Hrs.	CHNN-507	Practical II	-----	-----	3
Total			480	120	24

*EachCHNN-506andCHNN–507includes30marksofvivainthetotalof150marksof viva voceexamination (Details as shown in 15.)
Working per semester minimum 90 days (15weeks)

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NORTH GUJARAT UNIVERSITY, PATAN

M.Sc. (Chemistry) Semester – II

CourseCHNN–

501(Corecompulsory)

InorganicChemistry

I Electronic Spectra and Magnetic Properties of TransitionMetalComplexes **20Hrs**

Spectroscopic ground states, correlation, Orgel and Tanabe-Sugano diagrams for transition metal complexes (dI-d9 states), calculations of Dq, B and [3 parameters, charge

transferspectra,spectroscopicmethodofassignmentofabsoluteconfigurationinoptically active metal chelates and their stereochemical information, anomalousmagnetic moments, magnetic exchange coupling and spin crossover.

II MetalPi-Complexes
12Hrs

Metal carbonyls, structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding, structure and important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes; tertiary phosphine as ligand.

III MetalClusters
14Hrs

Higher boranes, carboranes, metalloboranes and metallocarboranes. Metal carbonyl and halide clusters, compounds with metal-metal multiple bonds.

Unit-IV(A) Isopoly and Heteropoly AcidsandSalts **3Hrs**

(B) Sigma bonded organometalliccompounds

s **11Hr**

of transition metals, classification, synthesis, structure, properties and applications

Books Suggested

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.

2. Inorganic Chemistry, J.E. Huhey, Harpes&Row.~

3. Chemistry of the Elements, vN.N. Greenwood and A. Earnshow, Pergamon.

4. Inorganic Electronic Spectroscopy, A.B.P. Lever, Elsevier.

5. Magnetochemistry, FI.L. Carlin, Springer Verlag.

6. Comprehensive Coordination Chemistryeds., G. Wilkinson, FLD. Gillars and J.A. McCleverty, Pergamon.

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NORTH GUJARAT UNIVERSITY, PATAN
M.Sc. (Chemistry) Semester – II
CourseCHNN–502(Corecompulsory)
OrganicChemistry

Unit-I (A) AliphaticElectrophilicSubstitution **5 Hrs**

Bimolecular mechanisms- SE2 and SEi. The SE1 mechanism, electrophilic substitution accompanied by double bond shifts. Effect of substrates, leaving group and thesolvent polarity on the reactivity.

(B) AromaticElectrophilicSubstitution **6 Hrs**

The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/para ratio, ipso attack, orientation in other ring systems. Quantitative treatment of reactivity in substrates and electrophiles. Diazonium coupling, Vilsmeirreaction, Gattermann-Koch reaction.

Unit-II (A) AromaticNucleophilicSubstitution **5 Hrs**

The SNAr, SN1, benzyne and SRN1 mechanisms. Reactivity - effect of substrate structure, leaving group and attacking nucleophile. The von Richter, Sommelet-Hauser, and Smiles rearrangements.

(B) Addition to Carbon-CarbonMultipleBonds **7 Hrs**

Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio- and chemoselectivity, orientation andreactivity. Addition to cyclopropane ring. Hydrogenation of double and triple bonds, hydrogenation of aromatic rings. Hydroboration. Michael reaction. Sharpless asymmetric epoxidation.

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Unit-III (A) Addition to Carbon-HeteroMultipleBonds **12Hrs**

Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acids, esters and nitriles. Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Wittig reaction.

Mechanism of condensation reactions involving enolates - Aldol,.Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions.

Hydrolysis of esters and amides, ammonolysis of esters.

(B)EliminationReactions **5Hrs**

The E2, E1 and Ech mechanisms and their spectrum. Orientation of the double bond. Reactivity - effects of substrate structures, attacking base, the leaving group and the medium.

Mechanism and orientation in pyrolytic elimination.

Unit-IVPericyclicReactions **20Hrs**

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3- butadiene, 1,3,5-hexatriene and allyl system. Classification of pericyclic reactions. Woodward - Hoffmann correlation diagrams. FMO and PMO approach. Electrocyclic reactions - conrotatory and disrotatory motions, 4n, 4n+2 and allyl systems. Cycloaddditions -antarafacial and suprafacial additions, 4n and 4n+2 systems, 2+2 addition of ketenes, 1.3 dipolar cycloadditions and cheleotropic reactions.

Sigmatropicrearrangements-suprafacialandantarafacialshiftsofH,Sigmatropicshifts involvingcarbonmoieties,3,3-and5,5-Sigmatropicrearrangements.Claisen,Copeand aza - Cope rearrangements. Fluxional tautomerism. Enereaction.

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Unit-III (A) Addition to Carbon-HeteroMultipleBonds **12Hrs**

Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acids, esters and nitriles. Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Wittig reaction.

Mechanism of condensation reactions involving enolates - Aldol,.Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions.

Hydrolysis of esters and amides, ammonolysis of esters.

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Sigmatropicrearrangements-suprafacialandantarafacialshiftsofH.Sigmatropicshifts involvingcarbonmoieties,3,3-and5,5-Sigmatropicrearrangements.Claisen,Copeand aza - Cope rearrangements. Fluxional tautomerism. Enereaction.

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Books Suggested

1. AdvancedOrganicChemistry-Reactions,MechanismandStructure,JerryMarch, JohnWiley.
2. Advanced Organic Chemistry, F. A. Carey and R. J. Sundberg,Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes,Longman.
4. StructureandMechanisminOrganicChemistry,C.K.Ingold,CornellUniversity Press.
5. Organic Chemistry, R. T. Morrison and R. N. Boyd,Prentice-Hall.
6. Modern Organic Reactions, H. 0. House,Benjamin.
7. Principles of Organic Synthesis, R. O. C. Norman and J. M. Coxon,Blackie Academic &Professional.
8. Pericyclic Reactions, 8. M. Mukherji, Macmillan.India.
9. Reaction Mechanism in Organic Chemistry, 8. M. Mukherji and S. P.Singh, Macmillan.
10. StereochemistryofOrganicCompounds,D.Nasipuri,NewAgeInternational.
11. StereochemistryofOrganicCompounds,P.S.Kalsi,NewAgeInternational.

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NORTH GUJARAT UNIVERSITY, PATAN
M.Sc. (Chemistry) Semester – II
CourseCHNN–503(Corecompulsory)
PhysicalChemistry

Unit-IChemicalDynamics **20Hrs**

Methods of determining rate laws, collision theory of reaction rates, steric factor, activated complex theory, Arrhenius equation and the activated complex theory; ionic reactions, kinetic salt effects, steady state kinetics, kinetic and thermodynamic control of reactions, treatment of unimolecular reactions.

Dynamic chain (hydrogen-bromine reaction, pyrolysis of acetaldehyde, decomposition of ethane), photochemical (hydrogen-bromine and hydrogen-chlorine reactions) and oscillatory reactions (Belousov -Zhabotinsky reaction), homogeneous catalysis, kinetics of enzyme reactions, general features of fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis and the nuclear magnetic resonance method. Dynamics of molecular motions, probing the transition state, dynamics of barrierless chemical reactions in solution, dynamics of unimolecular reactions (Lindemann — Hinshelwood and Rice-Ramsperger - Kassel—Marcus [RRKM] theories of unimolecular reactions)

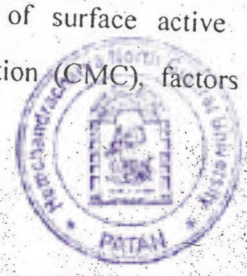
Unit-IISurfaceChemistry

(A) Adsorption **12Hrs**

Surface tension, capillary action, pressure difference across curved surface (Laplace equation), vapour pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, estimation of surface area (BET equation), surface films on liquids (Electro-kinetic phenomenon), catalytic activity at surfaces.

(B) Micelles

Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants,



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counter ion binding to micelles, thermodynamics of micellization - phase separation and mass action models, solubilization, micro emulsion, reverse micelles.

Unit-IIIMacromolecules **08Hrs**

Polymer — definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of polymerization, mechanism of polymerization.

Molecular mass, number and mass average molecular mass, molecular mass determination (osmometry, viscometry, diffusion and light scattering methods), sedimentation, chain configuration of macromolecules, calculation of average dimensions of various chain structures.

Unit-IVElectrochemistry **20Hrs**

Electrochemistry of solutions. Debye-Hiickel - Onsager treatment and its extension, ion solvent interactions. Debye-HUckel-Jerum mode. Thermodynamics of electrified interface equations. Derivation of electro-capillarity, Lippmann equations (surface excess), methods of determination. Structure of electrified interfaces. Guoy -Chapman, Stern, Graham — Devanathan — Mottwatts, Tobin, Bockris, Devanathan models.

Over potentials, exchange current density, derivation of Butler -Vo|mer equation, Tafel plot.

Quantum aspects of charge transfer at electrodes-solution interfaces, quantization of charge transfer, tunneling.

Semiconductor interfaces — theory of double layer at semiconductor, electrolyte solution interfaces, structure of double layer interfaces. Effect of light at semiconductor solution interface.

Electrocatalysis — influence of various parameters. Hydrogen electrode. Bioelectrochemistry, threshold membrane phenomena, Nernst—Planck equation, Hodges - Huxley equations, core conductor models, electrocardiography.

Polarography theory, Ilkovic equation; half wave potential and its significance. Introduction to corrosion, homogenous theory, forms of corrosion, corrosion monitoring and prevention methods.

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Books Suggested

1. Physical Chemistry, P.W. Atkins,ELBS.
2. Introduction to Quantum Chemistry, A.K. Chandra, Tata McGrawHill.
3. Quantum Chemistry, Ira N. Levine, PrenticeHall.
4. Coulson's Valence, R. McWeeny,ELBS.
5. Chemical Kinetics, K. J. Laidler, Mcgraw-Hill.
6. KineticsandMechanismofChemicalTransformations,J.RajaramanandJ.Kuriacose, McMillan.
7. Micelles, Theoretical and Applied Aspects, V. Moroi,Plenun
8. Modern Electrochemistry Vol. I and Vol. II, J.O.M. Bockris and A.K.N. Fteddy,Plenum.
9. IntroductiontoPolymerScience,V.Fl.Gowarikar,N.V.VishwanathanandJ.Sridhar, WileyEastern.

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NORTH GUJARAT UNIVERSITY, PATAN
M.Sc. (Chemistry) Semester – II
Course CHNN – 504 (Core compulsory)
Spectroscopy – part II

Unit-I 8 Hrs

(A) AtomicSpectroscopy **4 Hrs**

Energies of atomic orbitals, vector representation of momenta and vector coupling, spectra of hydrogen atom and alkali metal atoms.

(B) MolecularSpectroscopy **4 Hrs**

Energy levels, molecular orbitals, vibronic transitions, vibrational progressions and geometry of the excited states, Franck-Condon principle, electronic spectra of polyatomic molecules. Emission Spectra; radiative and non-radiative decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra.

Unit-II

RamanSpectroscopy **10 Hrs**

Classical and quantum theories of Raman effect. Pure rotational, vibrational and vibrational-rotational Raman spectra, selection rules, mutual exclusion principle. Resonance Raman spectroscopy, coherent anti Stokes Raman spectroscopy (CARS).

Unit-III

MicrowaveSpectroscopy **8Hrs**

Classification of molecules, rigid rotor model, effect of isotopic substitution on the transition frequencies, intensities, non—rigid rotor. Stark effect, nuclear and

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electron spin interaction and effect of external field. Applications.

Unit-IV NMR **25 Hrs**

Nuclear Magnetic Resonance Spectroscopy

Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, deshielding, spin-spininteractions, factors influencing coupling constant 'J'. Classification (ABX, AMX, ABC, A282 etc.), spin decoupling; basic ideas about instrument, NMR studies. of nuclei other thanproton - ^{19}F and ^{31}P. FT NMR, advantages of FT NMR, use of NMR in medicaldiagnostics

Books Suggested

1. Modern Spectroscopy, J.M. Hollas, JohnWiley.
2. Applied Electron Spectroscopy for Chemical Analysis Ed. H. Windawi and FL. Ho, WileyInterscience.
3. NMR, NOR, EPB and Mossbauer Spectroscopy in Inorganic Chemistry, RV. Parish, EllisHarwood.
4. Physical' Methods in Chemistry, R.S. Drago, SaundersCollege.
5. Chemical Applications of Group Theory, F. A.Cotton.
6. Introduction to Molecular Spectroscopy, G.M. Barrow, McGrawHill.
7. Basic Principles of Spectroscopy, R. Chang, McGrawHill.
8. Theory and Applications of UV Spectroscopy, H.H. Jaffe and M. Orchin,IBH—Oxford.
9. Introduction to Photoelectron Spectroscopy, P. K. Ghosh, JohnWiley.
10. Introduction to Magnetic Resonance, A Carrington and AD. Maclachalan, Harper &Row.

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NORTH GUJARAT UNIVERSITY, PATAN

M.Sc. (Chemistry) Semester – II

CourseCHNN–505(A)(Electivecourse)

Organ transition Metal Chemistry

Unit-I (A) Alkyls and Aryls ofTransitionMetals 3Hrs

Types, routes of synthesis, stability and decomposition pathways, organocopper in organic Synthesis

(B) FluxionalOrganometallic Compounds 6Hrs

Fluxionality and dynamic equilibria in compounds such as 112- olefin, n3~ allyl and dienyl complexes

Unit-II (A) Compounds of Transition Metal-CarbonMultipleBonds 9Hrs

Alkylidenes, alkylidynes, low valent carbenes and carbynes- synthesis, nature of bond, structural characteristics, nucleophilic and electrOphilic reactions on the ligands, role in organic synthesis

(B) Transition Metal Compounds with BondstoHydrogen 2Hrs

Transition metal compounds with bonds to hydrogen.

Unit-III Homogeneous Catalysis 10 Hrs

Stoichiometric reactions for catalysis, homogeneous catalytic hydrogenation, Zeigler-Natta polymerization of olefins, catalytic reactions involving carbon monoxide such as hydrocarbonylation of olefins (OXO reaction), oxopalladation reactions, activation of 0-H bond.

Books Suggested

1. Principles and Application of Organotransition Meta! Chemistry, J.P. Collman, L.S. Hegsdus, J.Fl. Norton andFLG. Finke, University ScienceBooks.
2. The Organometallic Chemistry of the Transition Metals, RH. Crabtree, JohnWiley
3. Metallo-organic Chemistry, A.J. Pearson,Wiley.
4. Organometallic Chemistry, RC. Mehrotra and A. Singh, New AgeInternationa

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NORTH GUJARAT UNIVERSITY, PATAN
M.Sc. (Chemistry) Semester – II
CourseCHNN–505(B)(Electivecourse)
Bioinorganic and Supramolecular Chemistry

Unit-I (A) Metal Storage TransportandBiomineralization **3 Hrs**

Ferritin, transferrin, and siderophores

(B) CalciuminBiology **3Hrs**

Calcium in living cells, transport and regulation, molecular aspects of intramolecular processes, extracellular binding proteins

Unit-II Metalloenzymes **12Hrs**

Zinc enzymes —— carboxypeptidase and carbonic anhydrase. Iron enzymes — catalase, peroxidase and cytochrome P-450. Copper enzymes —- superoxide dismutase. Molybdenum oxatransferase enzymes — xanthine oxidase. Coenzyme vitamin 812

Unit-III Supramolecular Chemistry **12Hrs**

Concepts and language.

(A) Molecular recognition: Molecular receptors for different types of molecules including arisonic substrates, design and synthesis of coreceptor molecules and multiple recognition.

(B) Supramolecular reactivity andcatalysis.

(C) Transport processes and carrierdesign.

(D) Supramolecular devices. Supramolecular photochemistry, supramolecular electronic, ionic and switchingdevices.

Some example of self-assembly in supramolecular chemistry.

Books Suggested

1. Principles of Bioinorganic Chemistry, 3.]. Lippard and J.M. Berg, University ScienceBooks.
2. Bioinorganic Chemistry, I. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, University Science Books.
3. Inorganic Biochemistry vols I and II. ed. G.L. Eichhorn,Elsevier.
4. Progress in Inorganic Chemistry, Vols 18 and 38 ed. J.J. Lippard,Wiley.
5. Supramolecular Chemistry, J.M. Lehn,VCH

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M.Sc. SEM – II

Practical I

CHNN – 506 (Inorganic + Organic)

Qualitative and Quantitative Analysis

A. Separation and determination of two metal ions Cu-Ni, Ni-Zn, Cu-Fe etc. involving volumetric and gravimetric methods

Chromatography

Separation of cations and anions by Paper Chromatography

Column Chromatography — Ion exchange.

Preparations

Preparation of selected inorganic compounds and their studies by I.R., electronic spectra, Mossbauer, E.S.R. and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds.

1. VO(acac)2
2. $TiO(C_9H_8NO)_2 2H_2O$
3. cis-$K[Cr(C_2O_4)_2(H_2O)_2]$
4. $Na[Cr(NH_3)_2(SCN)_4]$
5. Mn(acac)3
6. $K_3[Fe(C_2O_4)3I$
7. Prussian Blue, Turnbull's Blue.
8. $Co(NH_3)_6][CO(NO_2)_6]$
9. cis-$[Co(trien)(NO_2)_2]Cl.H_2O$
10. $Hg[Co(SCN)_4]$
11. $[Co(Py)_2Cl_2]$
12. $[Ni(NH_3)_6]Cl_2$
13. $Ni(dmg)_2$
14. $[Cu(NH_3)_4]SO_4.H_20$

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Books Suggested

1. Vogel'sTextbookofQuantitativeAnalysis,revised,J.Bassett,R.C.Denney,G.H. Jeffery and J.Mendham,ELBS
2. Synthesis and Characterization of inorganic Compounds, W. L. Jolly, PrenticeHall
3. ExperimentsandTechniquesinOrganicChemistry,D.Pasto,C.JohnsonandM.Miller, Prentice Hall
4. Macroscale and Microscale Organic Experiments, K. L. Williamson, D. C.Heath.
5. Systematic Qualitative Organic Analysis, H. Middleton, AdwardArnold.
6. Handbook of Organic Analysis- Qualitative and Quantitative, H. Clark, AdwardArnold.
7. Vogel's Textbook of Practical Organic Chemistry, A. Ft. Tatchell, JohnWiley
8. Practical Physical Chemistry, A. M. James and F. E. Prichard,Longman
9. Findley's Practical Physical Chemistry, B. P. Levitt,Longman
10. Experimental Physical Chemistry, RC. Das and B. Behera, Tata McGrawHill.

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Qualitative Analysis

Separation, purification and identification of compounds of three component mixture using tlc and column chromatography, chemical tests. IR spectra to be used for functional group identification.

1) All solid

2) All liquid

3) Solid (S) + liquid (S)

Books Suggested

1. VogelsTextbookofQuantitativeAnalysis,revised,J.Bassett,R.C.Denney,G.H. Jeffery and J.Mendham,ELBS
2. Synthesis and Characterization of inorganic Compounds, W. L. Jolly, PrenticeHall
3. ExperimentsandTechniquesinOrganicChemistry,D.Pasto,C.JohnsonandM.Miller, Prentice Hall
4. Macroscale and Microscale Organic Experiments, K. L. Williamson, D. C.Heath.
5. Systematic Qualitative Organic Analysis, H. Middleton, AdwardArnold.
6. Handbook of Organic Analysis- Qualitative and Quantitative, H. Clark, AdwardArnold.
7. Vogel's Textbook of Practical Organic Chemistry, A. Ft. Tatchell, JohnWiley
8. Practical Physical Chemistry, A. M. James and F. E. Prichard,Longman
9. Findley's Practical Physical Chemistry, B. P. Levitt,Longman
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MSc. SEM – II

Practical - II

CHNN – 507 Physical Chemistry

Chemical Kinetics

(i) Determinationoftherateconstantfortheoxidationofiodideionsbyhydrogenperoxide studying the kinetics as an iodine clockreaction.

(ii) Flowing clock reactions (Ref: Experiments in Physical Chemistry byShowmaker) Instrument Not available

(iii) Determinationoftheprimarysalteffectonthekineticsofionicreactionsandtestingofthe Bronsted relationship (iodide ion is oxidised by persulphateion)

(vi) Oscillatory reaction.

Solutions

(i) Determinationofmolecularweightofnon—volatileandnon-electrolyte/electrolyteby cryoscomc method and to determine the activity coefficient of anelectrolyte. → Beckmann freezing point apparatus Not available

(ii) Determinationofthedegreeofdissociationofweakelectrolyteandtostudythedeviation from ideal behaviour that occurs with a strongelectrolyte.

Electrochemistry

(A) Conductometry

(i) To study the effect of solvent on the conductance of AgN03/acetic acid and to determine the degree of dissociation and equilibrium constant in different solvents and in their mixtures(DMSO,DMF,dioxane,acetone,water)andtotestthevalidityofDebye-Huckel-Onsagertheory.

(ii) Determinationoftheactivitycoefficientofzincionsinthesoiutionof0.002Mzincsulphate using Debye Hitckel's limitinglaw.

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(B)Potentiometry/pHmetry

I) Determinationofthestrengthofstrongandweakacidsinagivenmixtureusinga potentiometer/pHmeter.

II) Determination of temperature dependence of EMF of acell.

III) Determinationoftheformationconstantofsilver—ammoniacomplexandstoichiometryof the complexpotentiometrically.

IV) Acid—base titration in a non-aqueous media using a pHmeter.

V) Determination of activity and activity coefficient ofelectrolytes.

VI) DeterminationofthedissociationconstantofaceticacidinDMSO,DMF,acetoneand dioxane by titrating it withKOH.

VII) Determinationofthedissociationconstantofmonobasic/dibasicacidbyAlbert-Serjeant method.

VIII) Determinationofthermodynamicconstants,AG,ASandAHforthereactionbye.m.f. method.

$Zn + H_2SO_4 \longrightarrow ZnSO_4 + 2H$

Books Suggested

1. Vogel'sTextbookofQuantitativeAnalysis,revised,J.Bassett,R.C.Denney,G.H. Jeffery and J.Mendham,ELBS
2. Synthesis and Characterization of inorganic Compounds, W. L. Jolly, PrenticeHall
3. ExperimentsandTechniquesinOrganicChemistry,D.Pasto,C.JohnsonandM.Miller, Prentice Hall
4. Macroscale and Microscale Organic Experiments, K. L. Williamson, D. C.Heath.
5. Systematic Qualitative Organic Analysis, H. Middleton, AdwardArnold.
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7. Vogel's Textbook of Practical Organic Chemistry, A. Ft. Tatchell, JohnWiley
8. Practical Physical Chemistry, A. M. James and F. E. Prichard,Longman
9. Findley's Practical Physical Chemistry, B. P. Levitt,Longman
10. Experimental Physical Chemistry, RC. Das and B. Behera, Tata McGrawHill.

હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોન:(૦૨૭૬૬) ૨૩૭૦૦૦

Website : www.ngu.ac.in

Email : regi@ngu.ac.in

પરિપત્ર ક્રમાંક – ૩૨ / ૨૦૨૦

વિષય :– એમ.એસસી. કેમેસ્ટ્રીના સેમેસટર –૨ નાં અભ્યાસક્રમમાં (પ્રાયોગિક પરીક્ષા) માં સુધારણા અંગે..
સંદર્ભ : – અત્રેનો પરિપત્રનં. ૪૪/૨૦૧૯ , તારીખ : ૧૪/૦૩/૨૦૧૯

આ યુનિવર્સિટીના કેમેસ્ટ્રી વિષયના અનુસ્નાતક વિભાગના અધ્યક્ષશ્રી તથા સંલગ્ન સાયંસ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, એમ.એસસી.ના જૂન–૨૦૧૯ થી ક્રમશઃ અમલમાં આવેલ કેમેસ્ટ્રીના નવા અભ્યાસક્રમમાં કેમેસ્ટ્રી વિષયની અભ્યાસસમિતિ એ તેની તારીખ : ૨૯/૦૧/૨૦૨૦ ની સભાના ઠરાવક્રમાંક : ૦૪ થી કરેલ ભલામણ અનુસાર સેમસ્ટર–૨ માં (પ્રાયોગિક પરીક્ષા) સામેલ પરિશિષ્ટ મુજબનો સુધારો ડિસેમ્બર – ૨૦૧૯ થી અમલમાં આવે તે રીતે વિદ્યાશાખા /એકેડેમિક કાઉન્સિલવતી માન.કુલપતિશ્રીએ મંજૂર કરેલ છે. જેનો અમલ થવા સારૂ સબંધિતોને આથી આ સાથે મોકલવામાં આવે છે.

આ બાબતની સબંધિત અધ્યાપકો તથા વિદ્યાર્થીઓને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

નોંધ: (૧) વિદ્યાર્થીઓના ઉપયોગ સારૂ પરિપત્રની એક નકલ કોલેજ/ડિપાર્ટમેન્ટ ના ગ્રંથાલયમાં મૂકવાની રહેશે.

(૨) આ પરિપત્ર યુનિવર્સિટીની વેબ સાઈટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

કુલસચિવવતી

બિડાણ: ઉપર મુજબ

૨૦/૦૨/૨૦૨૦

નં.–એ કે / અ× સ / ૯૪૭ / ૨૦૨૦
તારીખ: ૧૮ / ૦૨ / ૨૦૨૦

પ્રતિ,
૧. અધ્યક્ષશ્રી , કેમેસ્ટ્રી ડીપાર્ટમેન્ટ, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૨. સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓ
૩. ડૉ. એમ. બી. પ્રજાપતિ (ડીનશ્રી – વિજ્ઞાન વિદ્યાશાખા),ગણિતશાસ્ત્ર ભવન, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૪. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (પાંચ નકલ)
૫. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)
૬. સીસ્ટમ એનાલીસ્ટ, કોમ્પ્યુટર(રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ. યુનિવર્સિટી,પાટણ તરફ પરિણામ માટે તથા વેબસાઈટ પર મૂકવા સારૂ.
૭. અનુસ્નાતક પ્રશાખા(એકેડેમિક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.
૮. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ–પરિપત્રની ફાઈલ અર્થે
૯. સિલેકટ ફાઈલે– (૨ નકલ)

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HEMCHANDRACHRAYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN – 384265

Faculty of Science

Revised Syllabus of M.sc.Chemistry

(Practical)

Sem – 2

W.E.F. December -2019 (and thereafter)

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DATE : 14/02/2020

Hemchandracharya North Gujarat University Patan

M.Sc. Sem-II (Chemistry)

(WEF June 2019)

Practical-1

Paper CHNN-506 (Inorganic + Organic)

Qualitative and Quantitative Analysis:

- Separation and determination of two metal ions Cu-Ni, Ni-Zn, Cu-Fe etc. Involving volumetric and gravimetric methods.
- Chromatography
- Separation of cations and anions by paper chromatography
- Column chromatography-Ion exchange.
- Preparation of selected inorganic compounds and their studies by I.R, Electronic Spectra, Mossbauer Spectra, ESR Spectra and Magnetic susceptibility measurements. Handling of air and moisture sensitive compounds.

Preparations of Inorganic Complex Salts:

1. $VO(AcAc)_2$
2. $TiO(C_9H_8NO)_2 2H_2O$
3. Cis-K(Cr(C2O4)2.(H2O)2]
4. $Na[Cr(NH_3)_2(SCN)_4]$
5. $Mn(AcAc)_3$
6. $K_3[Fe(C_2O_4)_3]$
7. Prussian Blue, Turnbull's Blue
8. $[Co(NH_3)_6]$ $[Co(NO_2)_6]$
9. Cis-$[Co(trien)(NO_2)_2]Cl.H_2O$
10. $Hg[Co(SCN)_4]$
11. $[Co(Py)_2Cl_2]$
12. $Ni(NH_3)_6]Cl_2$
13. $Ni(DMG)_2$
14. $[Cu(NH_3)_4]SO_4.H_2O$

Organic Separation:

Separation, purification and identification of organic compounds of three components mixture using TLC and Column Chromatography, chemical tests. IR Spectra to be used for Functional group Identification.

1. All solid compounds mixture (One Compound May be water soluble)
2. All liquid compounds mixture (All neutral Liquids)

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M.Sc. Sem-II (Chemistry)

(WEF June 2019)

Practical-2

Paper- CHNN-507 (Physical Chemistry)

SECTION : I

Chemical Kinetics / Partition coefficient / Phase Equilibrium. (Minimum 3)

1. To study the primary salt effect for kinetics of reaction between $K_2S_2O_8$ and KI and prove the Bronsted-jerrum equation.
2. To study the reaction between H_2O_2 and HI at two different temperatures and calculate the temperature coefficient and the energy of activation.
3. To study the kinetic reaction of decomposition of H_2O_2 catalysed by iodide ion. (Iodine clock reaction)
4. To determine the equilibrium constant of the reaction $KI + I_2 \rightarrow KI_3$ by distribution method.
5. To determine the formula of the complex formed between the cupric ion and ammonia by distribution method.

SECTION : II

Conductometry / PH metry / Potentiometry / Colourimetry (Minimum 5)

1. To determine the concentration of the given NaCl solution by conductometric titration using 0.1 N $AgNO_3$
2. Determine the degree of hydrolysis of aniline hydrochloride and calculate the dissociation constant of free base conductometrically.
3. To verify Debye-Huckel and Onsager (D.H.O.) equation for the salts NaCl/KCl.
4. Determine the amount of given mixture of HCl + $H_2C_2O_4$ using 0.1 N NaOH by pH metry.
5. To determine the dissociation constant of monobasic/ dibasic acid by pH metry.
6. To determine the 1st, 2nd and 3rd ionization constant of tribasic acid (phosphoric acid) using 0.1 N NaOH by pH metry.
7. To determine the formula and instability constant of silver ammonia complex by potentiometry.
8. To determine the solubility and solubility product of AgCl, AgBr, AgI & $Ag_2Cr_2O_7$ by potentiometry.
9. To determine the amount of Paracetamol in a given tablet by by using Colourimetry.
10. To determine the amount of phosphate in given in a given soft drink sample.

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Book Suggested:

1. Vogel's Textbook of Quantitative Analysis. revised, J Basserr, R. C. Denney, G. H. Jeffery and J. Mendham, ELBS.
2. Synthesis and Characterization of Inorganic Compounds, W. L. Jolly, Prentice hall.
3. Experiments and Techniques in Organic Chemistry, D. Pasto, C. Johnson and M. Miller, Prentice hall.
4. Macroscale and microscale Organic Experiments K. L. Williamson, D.C. Heath.
5. Systematic Qualitative Organic Analysis, H. Middleton, Adward Arnold.
6. Handbook of Organic Analysis-Qualitative and Quantitative, H. Clark, Adward Arnold.
7. Vogel's Textbook of practical Organic Chemistry, A. R. Tatchell, John Wiley.
8. Practical Physical Chemistry, A. M. James and F. E. Prichard, Longman.
9. Findley's Practical Chemistry, B. P. Levitt, Longman.
10. Experimental Physical Chemistry, R. C. Das and B. Behera, Tata Mc Graw Hill.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN-384265

Faculty of Science

M.Sc. Chemistry

Syllabus

Semester-III

PROGRAM : HNGU 2058

W.E.F June-2020 (and thereafter)

CURRICULUM

Hemchandracharya

North Gujarat University,

Patan.

M.Sc. (Chemistry)

(WEF June: 2020)

I/c. Registrar
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General Information of Semester III & IV

Syllabus According To CBCS Pattern

1. The medium of instruction, question papers as well as answers in examinations will be English only.

2. Passing standard: 40% as per the revised rules and regulation of Hemchandracharya North Gujarat University, Patan (ACA/AXS/744/2018, Date 27/4/2018).

3. Viva voice will be pertaining to practicals.

4. The degree will be awarded in M.Sc. (Chemistry) in specialized branch. The curriculum will be common for semester-III & IV for all branches.

5. The result sheet of all semesters will contain the name of elective papers selected by the candidate. The grade and the credit secured.

6. A maximum of 10% students passing second semester may be allowed for dissertation at the 4th semester. Such students will be exempted from practical as well as via of forth semester. In lieu of that the dissertation of candidate will be assessed with 100 marks of dissertation and 50 marks of the viva of dissertation.

If the number of students willing to opt dissertation exceeds 10% dissertation will be given on the basis of merit of combined marks of first and second semester. The dissertation will be allotted to the students in the beginning of third semester by head of the department / P.G. Center.

7. Intake of students every centre 40 (Organic branch) 25 for Inorganic & Physical branch, University Department.55 (Inorganic, Organic and Physical branches).

8. For semester III & IV

(A) The internal evaluation for total 120 marks will be done as per the continuous evaluation process as under.

	Marks
a) Weekly test of theory (minimum8)	56
b) Internal Practical examination (once a semester)	20
c) Students seminar (once a semester)	14
d) Problem Solving / New Practical	06
e) Book review(In students own handwriting ,Separate book for all)	07
f) Project work assessment (separate for all)	07
g) Quiz/Questionnaire	10
	Total = 120
(B) SE Paper Internal Evaluation	15
	Total = 135

9. A batch of chemistry Practical will consist of 20 students per teacher.

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10. For semester III the papers, CHNN-601-(I), CHNN-602-(I), CHNN-603-(I), CHNN-604-(I), are core compulsory. Furthermore, students will have to choice any one of CHNN-605A-(I), or CHNN-605B-(I), Practicals CHNN-606-(I), & CHNN-607-(I).

11. For semester IV, the papers, CHNN-701-(I), CHNN-702-(I), CHNN-703-(I), and CHNN-704-(I), are core compulsory. In addition, the students will have to choice any one of CHNN-705A-(I), or CHNN-705B-(I), Practicals CHNN-706-(I), & CHNN-707-(I).

12. For all the semesters, the total marks will be given out of 600. The cumulative grade will be per university rules.

Note: During the preparation of this curriculum, samples are taken for consideration of the followings:

A. Model curriculum of U.G.C
B. Concept of continuous evaluation
C. CGPA(Cumulative Grade Point Average Credit)
D. CBCS(Choice Based Credit System)
E. Semester approach
F. Revised rules and regulation of Hemchandracharya North Gujarat University, Patan.
G. NET(NATIONAL ELIGIBILITY TEST) curriculum

13. As per recent directive from university, all the 4 credit as well as 2 credit courses will have internal marks as indicated in the table.

14. For university examination for each batch, maximum-30 students.

15. The mark distribution of 150 marks of practical will be as under from – (CHNN-606-(I), + CHNN-607-(I),M.Sc. SEM-III & CHNN-706-(I), + CHNN-707-(I),M.Sc. SEM- IV.

SECTION – I : 40 Marks
SECTION – II : 40 Marks
SECTION - III : 40 Marks
Viva : 30 Marks

Total: 150 Marks …….. (Two full days)

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Inorganic Chemistry

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Hemchandrcharya
North Gujarat University Patan
M.Sc. (Chemistry) (WEF June: 2020)
Semester-III

Work Load	Paper No.	Subject	External Marks	Internal Marks	Credit
60 Hrs.	CHNN-601-(I)	Inorganic Spectroscopy Paper-I	70	30	4
60 Hrs.	CHNN-602-(I)	Inorganic Chemistry Paper-II	70	30	4
60 Hrs.	CHNN-603-(I)	Inorganic Chemistry Paper-III (Corrosion) or Coordination Chemistry	70	30	4
60 Hrs.	CHNN-604-(I)	Inorganic Pharmaceutical and Medicinal Chemistry	70	30	4
30 Hrs.	CHNN-605A-(I)	Environmental Chemistry	35	15	2
30 Hrs.	CHNN-605B-(I)	Smart & Nanomaterials	35	15	2
90 Hrs.	CHNN-606- (I)	Practical- I	75	-------	3
90 Hrs.	CHNN-607- (I)	Practical- II	75	-------	3
Total			465	135	24

- **Working per semester minimum 90 days(15 weeks)**

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M.Sc. Semester-III
Inorganic Chemistry Paper –I
(Inorganic Spectroscopy)
CHNN-601-(I)

Unit:- 1 E.S.R. & N.Q.R. Spectroscopy 25% (15 Hrs)

- **E.S.R. Spectra of transition metal complexes**
  Theory of E.S.R. (Basic principles). The presentation of E.S.R. Spectrum, Hyperfine splitting, Spin Hamiltonian, Applications.
- **N.Q.R. Spectroscopy:-**
  Theory of N.Q.R. Origin of Transition, Experimental Techniques. Townes and Dailey's Formula, Structural Information from N.Q.R, Illustrated by suitable Examples.

Unit:- 2 X-ray Photoelectron Spectroscopy 25% (15 Hrs)

Application of
(a)Valence-electron & photo-electron Spectroscopy
(b) X-ray photoelectron spectroscopy.

Unit:-3: Magneto Chemistry: 25% (15 Hrs)

Principle & application of magneto chemistry: Basic (Diamagnetic, Para magnetic, ferromagnetic, anti-ferromagnetic), Magnetic properties of free ions.

Unit:-4 Organo Metallic Compounds (OMC): 25% (15 Hrs)

General Introduction & Principles. Factors governing the properties of OMC, General trends in Chemical Properties, Nature of metal-carbon Bond, Preparative methods, Reactions & applications.
Organo Aluminum & Beryllium Compounds, Organo boranes

Reference Books:

1. Spectroscopic Identification of Organic Compounds by R. M. Silverstein and F. X. Webster, 6th edition, John Wiley & Sons.
2. Introduction to Spectroscopy by D. L. Pavia, G. M. Lampman and G. S. Kriz, 3rd edition, Thomson Brooks/Cole.
3. Spectroscopic Methods in Organic Chemistry by D. H. Williams and I. Fleming, 4th edition, Mcgraw–Hill Book Company.
4. Organic Spectroscopy by William Kemp, 3rd edition, Palgrave.
5. Organic Spectroscopy–Principles and Applications by Jag Mohan, 2nd edition, Narosa Publishing House.
6. Spectroscopy of Organic Compounds by P. S. Kalsi, 5th edition, New Age International Publishers.

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M.Sc. Semester-III
Inorganic Chemistry Paper –II
(Bio-inorganic & Organometallic Compounds)
CHNN-602-(I)

Unit:- 1 Bio-inorganic Chemistry **25% (15 Hrs)**

Introduction, The Biochemistry of iron, Iron Storage and Transport, Haemoglobin and Myoglobin, Cytochromes. Other Iron-Porphyrin Biomolecules, other Natural Oxygen Carriers, Iron-Sulphur Proteins.

Unit:-2 The Biochemistry of Transition metal **25% (15 Hrs)**

Zinc, Copper, Cobalt, Molybdenum and Tungsten Miscellaneous Other Elements: Vanadium, Chromium, Nickel.

Unit:-3 Organometallic Compounds **25% (15 Hrs)**

Organometallic Compounds & metal complexes as catalyst in Homogeneous & Heterogeneous Systems: Oxidative-addition, Reductive elimination. Migration (insertion) Reactions, Hydroformylation, Hydrogenation, Carboxylation.
Polymerization, Fisher-Troops Process, Water Gas Shift Reaction.

Unit:-4 Uranic Elements **25% (15 Hrs)**

Chemistry of Trans Uranic Elements:

Reference Books:

1. Organometallic Compounds, Vol.1 & 2 by G.E. Coates, M.L.H. Green and K. Wade, Metheun & Co. Ltd. London EC4.
2. Bioinorganic chemistry Gurudeep Chatwal
3. Inorganic chemistry, 45th Edition, James E Huheey and Ellen A Keiter.
4. Bioinorganic, Bioinorganic and Supramolecular Chemistry,P S Kalsi & J P Kalsi
5. Advanced Inorganic chemistry, 6th edition , Cotton and Wilkinson
6. Concoise Inorganic Chemistry J.D Lee
7. Organometallic Compounds by G.E. Coates, John Wiley & Sons, Inc., New York.
8. Organometallic Chemistry by H. Zeiss, Reinhold Publishing Corporation, New York.
9. Organometallic Chemistry by R.C. Mehrotra & Anirudh Singh, New Age International (P) Limited, Publishers, New Delhi.
10. Progress in Inorganic Chemistry, Vol. 1 by F.A. Cotton, Interscience, Pub.Inc., New York.
11. Organotransition Metal Chemistry by John F. Hartwing, University Science Books, Sausalito, California.

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M.Sc. Semester-III
Inorganic Chemistry Paper –III
(Corrosion)
CHNN-603-(I)

Unit:-1 Types of Corrosion **25% (15 Hrs)**

a. **Importance of Studying Corrosion.**
Electrochemical Mechanism- Type of Corrosion Damage, (Uniform Attack, Pitting, Dezincification, Intergranular Cracking).
b. **Corrosion Tendency And Electrode Potential:** The Oxygen Electrode and Differential Cell, Aeration Cell, Pourbaix Diagram, Emfiane Galvanic Series.

Unit:-2 Atmospheric Corrosion **25% (15 Hrs)**

a. **Polarization :** The polarized cell, How measured, Causes of polarization, Hydrogen
over voltage, Influence of polarization on corrosion rate.
b. **Atmospheric Corrosion :** Types of atmospheres, corrosion product films.
Factors influencing corrosivity of the atmosphere, Remedial measures.

Unit:-3 Underground Corrosion **25% (15 Hrs)**

a. **Underground Corrosion:** Factors Influencing The Corrosively of Soils, Pitting, Characteristics, Remedial Measures.
b. **Oxidation and Tarnish :** Theory e.g. of Oxidation, Wagner Theory of Corrosion.
Oxidation resistant alloys.

Unit:-4 Corrosion & Cracking **25% (15 Hrs)**

a. **Stray Current Corrosion:** Sources of stray current Detection of stray current.
Method of Measuring the Resistivity of Soil, Effect of stray current on steel covered by concrete. Damage of sneep by SC.
b. **Stress Corrosion Cracking** - Mechanism of cracking.
Hydrogen Cracking - Mechanism of Cracking.
Corrosion Fatigue - Mechanism of Cracking.
Fretting Corrosion - Mechanism of Cracking.
Treatment of Water and Steam System. Hot and Cold Water Treatment, Boiler Water Treatment.

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Reference Books:

1. Handbook of Industrial Chemistry, Vol.1 by K.H.Davis, F.S.Berner, CBS Publishers,Bangalore.
2. Comprehensive Coordination Chemistry, Chapter 57, 58.
3. Insight into Speciality Inorganic Chemicals, Chapter 15, by David Thompson, The Royal Society of Chemistry, 1995.
4. New Trends in Green Chemistry, 2nd Edition by V.K.Ahluwalia and M.Kidwai, Anamaya Publishers, 2007.
5. Pietro Pedeferri Corrosion Science and Engineering Springer ISBN: 9783030073800

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M.Sc. Semester-III
Inorganic Chemistry Paper –III
(Co-ordination Chemistry)
CHNN-603-(I)

Unit:- 1Theories of bonding: 25% (15 Hrs)

Theoretical principles of CFT, Introduction to spherical harmonics & the shape of d-orbitals, Derivation of crystal field potential for tetragonal, cubic and Square planar arrangement of ligands around central metal ion. Transformation of these potential from Cartesian to spherical harmonics. Effect of Voct on d^1 system. Evaluation of the various integrals involved. Solution of the secular determinant to obtain energies and corresponding wave functions, Crystal field splitting diagram for Oh, Td & Square planar systems.

Unit:-2Theory of Electronic Spectra 25% (15 Hrs)

R.S Coupling & J. J. Coupling
Ladder operators :

- Step up & Step down operators and their use to obtain wave functions.
- Derivation and use of the equation.

$$X(\alpha)=\frac{\sin(l+1)\alpha/2}{\sin \alpha/2} \quad =2A_{2g}/3T_{1g}$$

Unit:-3 Weak Field Approximation 25% (15 Hrs)

The splitting of the free ion terms of d2 in an oh field Calculation in weak field,approximation energy of the various terms;$2A_{2g}$,$3T_{2g}$, & $3T_{1g}$ derived from 3F(d2) in an Oh field.
Strong field approximation :
Determination of multiplicities by the method of descending symmetry.
Calculation of energy of various terms within the frame work of strong field approximation.

Unit:-4 Electronic Spectra of Metal Complexes 25% (15Hrs)

Introduction, Selection rules, Vibronic coupling spectra of Ti(III), VO(IV), Ni(II), Co(II), Co(III), Fe(II), Fe(III), Cu(II), Mn(II) complexes under different geometries, Jahn-Teller theorem.

Reference Books:

1. Advance Coordination Chemistry 1st Edition (English, Paperback, Shukla P R) Edition: 1st Edition, 2012 ISBN: 9789350515839, 9350515830
2. Inorganic Chemistry 3rd Edition 2008 by Donald A Tarr and Gary Miessler
3. UGC Advanced Inorganic Chemistry (English, Paperback, Keemti lal, S.K. Agarwal) ISBN: 9789386306289, 938630628X

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M.Sc. Semester-III
Inorganic Chemistry Paper –IV
"Inorganic Pharmaceutical & Medicinal Chemistry"
CHNN-604-(I)

Unit:- 1 Pharmacopocia and Monography: 25% (15 Hrs)

(a) Pharmacopocia and Monography:
Electrolytes, major physiological ions, physiological acid-base balance, acid base imbalance, electrolytes used for replacement therapy, electrolytes used in combination therapy.

(b) Gastro-intenstinal agents-Acidifying agents, gastric artacids, protective and adsorbents, saline cathartics
Antioxidants and buffers

Unit:-2 Respiratory System 25%(15Hrs)

Expectorants and Emetics-Symptoms of Respiratory Disease Expectorants, Antitussive and Emetics.

(a)Topical agents- Protective, Astringents and Antimicrobials

Unit:-3 Role of Metal ions in Medicine 25%(15Hrs)

Trace Elements- Copper, Iron, Iodine, Manganese, Zinc, Their Compounds and Their Relevance.

(a) Metals in Medicine: Biomedical Significance. Role of Metal Ions in Drug Design Platinum Antitumor Agents-Discovery and Development, Synthesis.

Unit:-4 Medicinal Metal Complexes 25% (15 Hrs)

(a) Vanadium Complexes- oxovanadium (IV)complexes for diabetes treatment
(b) Medicinal Applications of Metal complexes of N-Heterocyclic Carbenes (NHC)-NHC Precursors and Metal Complexes-Pyridine Based NHC Precursors and Metal Complexes, NHC Rhodium Complexes.

References:

1. A handbook of Inorganic Pharmaceutical Chemistry,Dr.K.G.Bothara,Nirali Prakashan.
2. Medicinal Inorganic Chemistry: American Chemical Society,Washington,DC
3. Medicinal Inorganic Chemistry: Orvig. CAbrams, M.J.Ed.,Chemical Reviews Vol.99,No.9, American Chemical Society,Washington,DC.1999.
4. Metallopharmaceuticals I & II,Clarke,M.J.,Sadler,P.,Eds,Springer,Verlag,New York,Inc.1999.
5. Uses of Inorganic Chemistry in Medicine, Farrell, N.,Ed, Springer-Verlag, New York,Inc.1999.

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M.Sc. Semester-III
Inorganic Chemistry Paper –V
(Environmental Chemistry)
CHNN-605-(A)
"SUBJECTIVE ELECTIVE"

Unit:- 1- Environmental Chemistry **50% (15 Hrs)**

Types of Water Pollutants: Organic, Inorganic, Radionucluds and their determination COD, BOD and Industrial Waste Water Treatment For Solids, Metals, Dissolved Organics and Inorganics.
Air Pollutants-CO, SO_x, NO_x, CFC, Hydrocarbon and Their Monitoring
Disposal of Hazardous Wastes.

Unit:- 2- Chemical and Bio fertilizers **50% (15 Hrs)**

Chemical Fertilizers, Applications, Adverse effects, Advantage of Bio fertilizers. Types of Mineral Fertilizers: Nitrogenous Fertilizers, Phosphoric and Potassium fertilizers, NPK grades.
Nitrogen bio fertilizer: Rhizobium(Symbiotic) Azetobactor(Non Symbiotic)
Phosphorus Bio fertilizer: P.S.B. phosphate solubilizing bacteria.

References:

1.Nanoparticles,buildings blocks of nanotechnology,Rotello V.Khwer Acad/ptenum publication,
N.Y.2004
2.Nanoscale materials in chemistry-ed.by Klabunde K.J.John-wile,N.Y.2001
3.The chemistry of nanomaterials: Synthesis,properties and applications ed.by.C.N.Rao, A.Miller and A.K.Cheetham,wiley-VCH,2004
4.Nanotechnology, Richard Booker,Earl Boysen,Wiley
5.Environmental Chemistry,Akde,Wiley Eastern Ltd.
6.Environmental Chemistry,B.K.Sharma,H.Kaur,Goel Publishing House,Meerut.
7. Environmental Chemistry, B.K.Sharma,Goel Publishing House,Meerut.

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M.Sc. Semester-III
Inorganic Chemistry Paper –III
(Advanced Industrial Inorganic Chemistry)
CHNN-605-(B)
"SUBJECTIVE ELECTIVE"

Unit:- 1- Nanomaterials in Chemistry **50% (15 Hrs)**

Introduction to Nanomaterials and Nanochemistry, Classification of Nanomaterials General Methods of Preparation and Applications. Chemical and catalytic aspects of Nanocrystals-Nanomaterials in catalysis, as adsorbents, as new chemical reagents.

Unit:- 2- Smart Materials **50% (15 Hrs)**

Ceramics, Alloys, Gels and Polymers. Piezoelectric Materials, Electrostrictive and Magnetostrictive Materials, Rheological, Thermoresponve, pH sensitive Halochromic Materials, Electrochromic Materials and Smart gels.

References:

1. Nanoparticles,buildings blocks of nanotechnology,Rotello V.Khwer Acad/ptenum publication,
N.Y.2004
2. Nanoscale materials in chemistry-ed.by Klabunde K.J.John-wile,N.Y.2001
3. The chemistry of nanomaterials: Synthesis,properties and applications ed.by.C.N.Rao, A.Miller and
A.K.Cheetham,wiley-VCH,2004
4. Nanotechnology, Richard Booker,Earl Boysen,Wiley
5. Environmental Chemistry,Akde,Wiley Eastern Ltd.
6.Environmental Chemistry,B.K.Sharma,H.Kaur,Goel Publishing House, Meerut.
7. Environmental Chemistry, B.K.Sharma,Goel Publishing House,Meerut.

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M.Sc. Semester-III
Inorganic Chemistry Paper –III

Practicals

CHNN-606-(I) & CHNN-607-(I)

1. Qualitative Analysis(Mixture of eight radicals, out of which two must be radical of less familiar elements W,Li,Th,V,Ce,Be,Ti,Mo)(Minimum-six)
2. Complexometric analysis of mixtures containing two components (at least four)
3. Water Analysis (Minimum Five)

Reference Books:

1. Qualitative Chemical semimicro analysis by V. N. Alexeyev, Mir Publishers Moscow.
2. Vogel's Qualitative Inorganic Analysis by G. Svehla, Orent Longman, New Delhi.
3. Vogel's Textbook of Quantitative Chemical Analysis, 5th edition by G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, ELBS Publication, 1996, Chapter 2, 3, 11.

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Organic Chemistry

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Hemchandracharya
North Gujarat University Patan
M.Sc. (Organic Chemistry) (WEF June: 2020)
M.Sc. Semester-III

Work Load	Paper No Course Code	Course Title Subject	External Marks	Internal Marks	Credits
60 Hrs.	CHNN-601-(O)	Natural Products	70	30	4
60 Hrs.	CHNN-602-(O)	Industrial Organic Chemistry	70	30	4
60 Hrs.	CHNN-603-(O)	Synthetic Drugs	70	30	4
60 Hrs.	CHNN-604-(O)	Selected Topics In Organic Chemistry	70	30	4
30 Hrs.	CHNN-605A-(O)	Green Chemistry	35	15	2
30 Hrs.	CHNN-605B-(O)	Photo Chemistry	35	15	2
90 Hrs.	CHNN-606-(O) Practicals	Organic Chemistry	75	-------	3
90 Hrs.	CHNN-607-(O) Practicals	Organic Chemistry	75	-------	3
		Total	465	135	24

- **Working per semester minimum 90 days (15 weeks)**

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M.Sc. Semester-III
Organic Chemistry Paper –I
Natural Products
CHNN-601-(O)

Unit-1 Natural Coloring Matter: 25% (15 Hours)

Classification General Method of Structural Determination, Biosynthesis studies of Anthocyanine (Cyanin and Palargonidin, Flavones (Chrysin), Flavonols (Quercetin), Flavonone (Dihydro flavone) and Isoflavones (Daidzein), Coumarin, Quinones (Polyporic acid), Porphyrin. Chemistry of Hemin and Chlorophyll.

Unit-2 Terpenoids: 25% (15 Hours)

Chemistry of Abietic Acid, Gibberellic acid Gibberellin-A), Squalene, Eudesmol, Phytol and Cadinene, Zingiberene, Biosynthesis study of Triterpenoid and Tetra terpenoid

Unit-3 Vitamins: 25% (15 Hours)

Detailed Study of Chemistry of Thiamine (Vitamin-B1), Pantothenic Acid (Vitamin-B2), Pyridoxine-(Vitamin-B6), Ascorbic Acid (Vitamin-C) Tocopherols (Vitamin-E), Biotin (Vitamin-H), and Biological importance of Vitamins.

Unit-4 Alkaloids: 25% (15 Hours)

General Biogenetic Studies of Alkaloids, Chemistry of Reserpine, Colchicine, Strychnine, Morpholine, Narcotine.

Basic Text & Reference Books:

1. Natural Products by O.P. Agarwal, vol. 1 & amp; 2
2. Organic Chemistry of Natural Products by G.R. Chatwal, Vol. 1 & 2
3. The Chemistry of Natural Products, K. W. Bentley, Vol. I -V (Interscience).
4. Organic Chemistry, Vol. 2, I. L. Finar, 5th Edition (1994) ELBS Publication.
5. Natural Products Chemistry, Vol. I & II K. Nakanishi et al., Academic press publication (1974).
6. The Molecules of Nature, J. B. Hendrickson, W. A. Benjamin Inc. (1965).
7. Selected Organic Synthesis, Ian Fleming John Wiley (1977).
8. Chemistry of Natural Products, N. R. Krishnaswamy, University Press (India) Ltd. (1999).
9. Classical Methods in Structure Elucidation of Natural Products, Reinhard W. Hoffmann by Wiley-VHCA.

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M.Sc. Semester-III
Organic Chemistry Paper –II
Industrial Chemistry
CHNN-602-(O)

Unit-1 Basic Principle of Unit Process & GMP, GLP: 25% (15 Hours)

Basic Chemical Data, Batch Versus Continuous Operation, Design Flowcharts, Chemical Process Selection, Safety Hazards, Fire and Toxic Materials, Research and Development, Patents. Good Manufacturing Practice and Laboratory Practice.

Unit Process and Unit Operations, Nitration, Halogenation, Animation, Sulphonation and Hydroxylation.

Unit-2: Soap, Detergents and Preservatives: 25% (15 Hours)

Detergents, Surfactants, Alkyl Benzenes, Fatty Acids and Fatty Alcohols, Soaps. Essential Oils, Constituents, Animal Fixatives, Fruit Concentrates, Vanilla, Chocolate, Monosodium Glutamate, Food Additives, Preservatives.

Unit-3: Oils, Fats & Agrochemicals: 25% (15 Hours)

Vegetable Oils, Cotton Seed Oil, Hydrogenation, Agrochemicals, Insecticides, Fungicides, Weedicides, Rodenticides, Plant Nutrients, Plant Hormones.

Unit-4 Pulp & Paper: 25% (15 Hours)

Pulp, Pulping Process, Sugar-Ethanol Industries Base Carboxyl Manufacture of Paper and Rayon.

Basic Text & Reference Books:

1. Industrial Chemistry By B.K Sharma
2. Unit Processes in Organic Synthesis. By P. H. Groggins
3. Shreves Chemical Process Industries By George T Austin
4. Industrial Organic Chemistry by Klaus Weissermann

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M.Sc. Semester-III
Organic Chemistry Paper –III
Synthetic Drugs
CHNN-603-(O)

Unit-1: Drug Design & QSAR: 25% (15 Hours)

Introduction Naming of Organic Medicinal Compounds, Literature of Medicinal Chemistry, Classification of Drugs, Drug Design, Relation between Molecule Structure and Biological Activity (QSAR), Receptor Site Theory, Pharmacopies, Indian Standards, Modern Methods of Pharmaceutical Analysis, Diagnostic Agents, Pharmaceutical Aids: Solvents, Vehides, Flavors, Suspending Agents, Surfactants, Emulsifying Agents.

Unit-2: Antibiotics: 25% (15 Hours)

Classification, Synthesis and Activity of Penicillin, Cephalosporins, Streptomycin, Tetracycline's, Actinomycin, Chloramphenicol and Polyene.

Unit-3:Sulphadrugs: 25% (15 Hours)

Chemistry of Sulpha Drugs, Synthesis and Uses, Sulphanilamide, Sulphafurazole, Sulphaguanidine, Sulphathiazole, Sulphamerazine, Sulfalene, Sulfathiazole, Trimethoprim.

Unit-4: Miscellaneous Drugs: 25% (15 Hours)

Drugs Stimulating or Blocking The Peripheral Nervous System: Cholinergic & Anticholinergic Drugs, Histamine & Antihistamine, Local and General Anesthetics.

Basic Text & Reference Books:

1. Medicinal Chemistry by Ashutosh Kar
2. Medicinal Chemistry by G.R. Chatwal
3. Adhunik Sanslidh Aushadhi nu Rasayanvigyan / Anamik K.Shah. University Granth Nirman Board , Ahmedabad
4. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical, Chemistry,11th Edition by John H. Block & John M. Beale, Published by Lippincott Williams & Wilkins (2004).
5. Principles of Medicinal Chemistry, 4th Edition by William O-Foye, Thomas L. Lemke and David A.Williams, Published in India by B. I. Waverly Pvt. Ltd. New Delhi (1995).

6. Essential of Medicinal Chemistry, 2nd Edition by Andrejus korolkovas, Published by Wiley-India Edition (1988).
7. Instant Notes: Medicinal Chemistry, Edited by Graham L. Patric, Published by Viva Books Private Ltd. (2002)
8. Textbook of Medicinal Chemistry Vol. I & II by V. Alagarsamy Published by Elsevier (2010).
9. Medicinal Chemistry 3rd Edition by Ashutosh Kar Published by New age international (P) Limited, Publishers (2005).
10. Medicinal Chemistry Edited by Alfred Burger Published by Interscience Publishers, John Wiley & Sons, New York (1951)
11. Burger's Medicinal Chemistry and Drug Discovery Vol. 3: Therapeutic agents Edited by Manfred E. Wolff Published by Interscience Publishers, John Wiley & Sons, New York (1996)
12. Burger's Medicinal Chemistry 4th Edition : Part III Edited By Manfred E. Wolff Published by Interscience Publishers, John Wiley & Sons, New York (1981)
13. Organic Chemistry, Vol. 2, I. L. Finar, 5th Edition (1994) ELBS Publication.
14. Natural Products Chemistry, Vol. I & II K. Nakanishi et al., Academic press publication (1974).
15. The Molecules of Nature, J. B. Hendrickson, W. A. Benjamin Inc. (1965).
16. Selected Organic Synthesis, Ian Fleming John Wiley (1977).
17. Chemistry of Natural Products, N. R. Krishnaswamy, University Press (India) Ltd. (1999).
18. Medicinal Chemistry by D. Shriram.
19. Synthetic Organic Chemistry O P Agarwal.
20. Synthetic Drug J J Trivedi & K A Thakar.
21. Synthetic Drug by Anamik Shah.

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M.Sc. Semester-III
Organic Chemistry Paper –IV
Selected Topics IN Organic Chemistry
CHNN-604-(O)

Unit-1: Heterocyclic Chemistry-I 25% (15 Hours)

Introduction of Heterocyclic Compounds, Nomenclature and Classification of Heterocyclic Compounds, Monocyclic Diheteroatomic Compounds (5 & 6 members) Synthesis and Chemical Reactivity of Pyrazole, Isoxazole, Isothiazole, Imidazole, Oxazole, thiazole.

Unit-2: Heterocyclic Chemistry-II 25% (15 Hours)

Reaction and Synthesis of Bicyclic Heterocyclic Compounds Quinoline and Isoquinoline, Nucleophilc Substitution with Displacement of Halide, Reactions with Reducing Agents, Grignard's Reaction. Electrophilic substitution reactions of substituted Quinoline and Isoquinoline.

Synthesis of Quinolone: Skraup Synthesis, Knorr Synthesis, Isoquinoline: Bischner-Napieralski Synthesis, Heterocyclic System Containing Two Nitrogen Atoms: Synthesis of Cinnoline, Quinolone, Quinoxaline, Phthalazine.

Unit-3: Application of Oxidation Reagents: 25% (15 Hours)

$Na_2Cr_2O_7$, $KMnO_4$, CF_3COOH, MnO_2, Ag_2CO_3, $NaIO_4$, SeO_2, H_2O_2, Al(O-iPr)$_3$, Al(O-tBu)$_3$

Unit-4: Application of Reduction Reagents: 25% (15 Hours)

$LiAlH_4$, Fe+HCl, NH_2NH_2, BH_3, $NaBH_4$, $NaBH_4$+ $CeCl_3$ $7H_2O$, Pd/H_2, Ni/H_2, Pt/H_2, Diisobutyl Aluminum Hydride(DIBAl-H), Sodium Cyano Borohydride and Sodium triacetoxy Borohydride,

Basic Text & Reference Books:

1. Heterocyclic Chemistry II Volume I,II, III R R Gupta, M Kumar, V Gupta, Springer R. K. Bansal
2. Modern Methods of Organic Synthesis 4th Edition by W. Caruthers, Iain Coldham
3. Heterocyclic Chemistry, 4th Edition by J. A. Joule & K. Mills, Published by Chapman & Hall (1995)

4. Principles of Modern Heterocyclic Chemistry, Edited by Leo A. Paquette, Published by Pearson Benjamin Cummings (1968)
5. Heterocyclic Chemistry, 3rd Edition by Thomas L. Gilchrist, Published by Prentice Hall (1997)
6. The Structure & Reactions of Heterocyclic Compounds, Edited by Michael Henry Palmer, Published by Edward Arnold (1967)
7. Heterocyclic Chemistry by V. K. Ahluwalia, Narosa Publishing House.

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M.Sc. Semester-III
Organic Chemistry Paper –V
Green Chemistry
CHNN-605-(A)
(Subject Elective)

Unit-1: Green Chemistry-1: 50% (15 Hours)

Green Chemistry Definition and Introduction, Need for Green Chemistry, Metathesis: A Classical Example of Green Chemistry, Principal of Green Chemistry, Green Chemistry in India , Green Guidelines Used in Laboratory, Green Chemistry in Everyday life.

Unit-2: Green Chemistry-2: 50% (15 Hours)

Tools of Green Chemistry, Green Starting Materials, Green Catalysts, Green Reactions, Green Solvents, Ionic Liquids, Green Reaction Conditions, Green Chemical Products, Reactions in Solid Phase, Catalysis, Biocatalysts and Phase Transfer Catalyst, Use of Renewable Feed Stock, Energy Efficiency, Green Chemistry Practices, Organic Preparations, Synthesis of Green Reagents.

Basic Text & Reference Books:

1. Green Chemistry Gurtu Gurtu Pragati 1st Edition 2012 ISBN:93-5006-655-6

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M.Sc. Semester-III
Organic Chemistry Paper –V
Photo Chemistry
CHNN-605 (B)
(Subject Elective)

Unit-1: Photochemistry & Photochemistry of Alkenes: 50% (15 Hours)

Introduction of Electromagnetic Radiant with Matter, Law of Photochemistry, Fate of Excited Molecule, Types of Excitations, Transfer of Excitation Energy, Quantum Yield / Quantum Efficiency, Photolytic Cleavage, The fate of Excited Molecule, Physical and Chemical Process, Intermolecular Reactions of the Olefinic Bond, Geometrical Isomerism, Cyclisation Reactions, Rearrangement of 1,4 and 1,5 dienes.

Unit-2: Photochemistry of Carbonyl & Aromatic Compounds
50% (15 Hours)

Norrish Type-1 α-Cleavage Reaction, Norrish Type-2 Reaction, Intermolecular Reactions of Carbonyl Compounds Saturated Cyclic and Acyclic, β-γ, unsaturated and α-β,Unsaturated Compounds, Cyclohexaenones, Intermolecular Cycloaddition Reactions Dimerization and Oxetane Formation, Isomerization, Additions and Substitutions, Di-π Methane Rearrangement.

Basic Text & Reference Books:

1. Fundamentals of Photochemistry K.K. Rohatgi-Mukherjee, Wiley Eastern
2. Essentials of Molecular Photochemistry Agillbertandj Baggott Blackwell Scientific
3. Molecular Photochemistry N.J Turro W A Benjamin.
4. Introductory Photochemistry ACox andTCamp McGraw-Hill
5. Photochemistry, R.P Kundall and A.Gillbert Thomson Nelson
6. Organic Photochemistry J. Coxon and Balton Cambridge University Press.
7. Environmental Chemistry H Kaur Pragati 8th Edition 2014 ISBN:978-93-5140-060-8
8. Vogel's Textbook of Practical Organic Chemistry, 5th edition, B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchell (Pearson Education)
9. Comprehensive Practical Organic Chemistry: Preparation and Quantitative analysis, V.K. Ahluwalia, Renu Aggarrwal (Universities Press)

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M.Sc. Semester-III
Organic Chemistry Practical
CHNN-606-(O) & CHNN-607-(O)

1) **Organic Separation:**
Separation, Purification and Identification of three Compounds (Trinary Mixture) 10 grams Organic Mixture by Semi Micro Method- Preparation of Derivative. (Minimum Five Mixtures should be done).

2) Organic Estimation (Semi Micro Methods):

1. Estimation of Penicilline
2. Estimation of Amino acids
3. Estimation of Sulphadrugs
4. Estimation of Enol group
5. TLC of Dyes

Organic Preparation:
Two & Three stage preparation from 4 & 5 grams starting materials (semi micro method) Minimum five should be done including name reactions.

Basic Text & Reference Books:

1. Vogel's Textbook of practical organic chemistry, 5th edition, B. S. Furniss, A. J.
Hannaford, P. W. G. Smith, A. R. Tatchell (Pearson Education)
2. Comprehensive Practical Organic Chemistry: Qualitative Analysis, V. K. Ahluwalia, Sunita Dhingra (Universities Press)
3. Organic structures from spectra, 5th edition, L. D. Field, S. Sternhell, J. R. Kalman (Wiley: A John Wiley & Sons Ltd publication)
4. Elementary Organic Spectroscopy: Principles and Chemical applications (revised edition), Y. R. Sharma (S. Chand Publishing)

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Physical Chemistry

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Hemchandracharya
North Gujarat University, Patan
M.Sc. (Physical Chemistry) (New Syllabus WEF June:2020)
M.Sc. Semester-III

Work Load	Paper No Course Code	Course Title Subject	External Marks	Internal Marks	Credits
60 Hrs.	CHNN-601-(P)	Physical Chemistry	70	30	4
60 Hrs.	CHNN-602-(P)	Physical Chemistry	70	30	4
60 Hrs.	CHNN-603-(P)	Physical Chemistry	70	30	4
60 Hrs.	CHNN-604-(P)	Physical Chemistry	70	30	4
30 Hrs.	CHNN-605A-(P) (SE)	Physical Chemistry	35	15	2
30 Hrs.	CHNN-605B-(P) (SE)	Physical Chemistry	35	15	2
90 Hrs.	CHNN-606-(P) Practicals	Physical Chemistry	75	-------	3
90 Hrs.	CHNN-607-(P) Practical	Physical Chemistry	75	-------	3
		Total	465	135	24

- **Working per semester minimum 90 days (15 weeks).**

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M.Sc. SEMESTER-III
Physical Chemistry
CHNN-601(P)
Paper-I

Unit-1 Photo Chemistry **25% (15 Hours)**

Basics: Einstein law, laws of Photochemistry (Grothus law, -Draper law, Bunsen-roscoe's, law of photochemical equivalence, Plotnikov law), quantum yield, Deviation from photochemical equivalence, (Reasons of high and low yield), experimental methods for determination of quantum yield , factors affecting quantum yield.

Photochemical kinetics: Rate constants of reactive energy states, life times of reactive energy states, seat of photochemical reactions, Determination of rate constants of reactions, effect of light intensity on the rate of photochemical reaction, photo reaction which do not involve chain reaction and reactions which involve chain reaction.

Photochemical reaction: types and classification of photo chemical reaction, photooxidation, photo oxygenation, photo fragmentation, photo dissociation, photo isomerisation and photo reduction,

Environmental photochemistry: photo dissociation of oxygen, photo oxidation of proteins, formation of smog, thermo luminescence, phonophoresis, photochemical inhibition, photo reduction of dyes by two electron transfer process.

Unit 2: Adsorption **25% (15 Hours)**

Isotherm: Chemical & physical adsorption isotherm, Freundlich, Langmuir and BET adsorption equation, Gibb's adsorption isotherm, Temkin adsorption isotherm.

Experimental Adsorption Measurements: methods for surface area, Measurement of adsorption isotherm (Experimental), determination Enthalpy and heat of adsorption

Films: Structure of surface films, Status of monomolecular surface films and their advantage, Types of insoluble films, Gaseous films and continues film.

Application: Detergency and Adsorption and Homogeneous/ Heterogeneous catalysis, Adsorption and indicators, adsorption and Water (softening, deionization, electrical demineralization).

Unit: 3 Solid state chemistry **25% (15 Hours)**

Solid: Type of solids, Difference between crystalline solid and Amorphous solid, close packing perfect and imperfect crystals, intrinsic and extrinsic defects, point defects, line and plane defects. Schottky and Frenkel defects, consequences of stoichiometric defects,

Crystal Growth: Factors affecting the shape of growing crystal, crystal growth and Techniques of single crystal growth.

Conductorone theory of solids. Super conductors, upper conductors of type I and II BCS theory of superconductors, Messner's effect.

Solid state reactions: General principles, experimental procedures, co-precipitation as a precursor to solid state reaction, kinetics of solid-state reaction.

Unit: 4 Phase Equilibrium **25% (15 Hours)**

Phase, components, degree of freedom, condition for equilibrium between phases, The Gibb's phase rule, Derivation of the phase rule, One-component system, The water system, The carbon dioxide system, The sulphur system, Some typical solved examples for One-component System, The liquid helium system, High pressure phase diagrams, The water system, the carbon system, Two-component system, Type A simple eulectic systems, Thermal analysis: cooling curves, Lead-silver system, Bismuth-Cadmium System, potassium iodide-water system, Representation of triangular plot, Partially miscible ternary liquid system, Experimental methods used for Obtaining triangular, Phase transition-second order, Exercises.

Books:

1. Fundamentals of Photochemistry, R.K. Rohatgi and Mukherji, Tata McGraw Hall,
2. Essentials of Photochemistry, A. Gilbert and J. Baggott, Black well Scientific publishers.
3. Introductory Photochemistry, A. Cox and T camp, Mac Graw Hill.
4. Organic Photochemistry, J. Coxon and Hilton, Cambridge University Press.
5. Physical Chemistry, A.W. Atkin, ELBS
6. Advanced Physical Chemistry, Gurdeep Raj, Himalayan Publication 1997.
7. Solid State Chemistry and its Applications, A.R. West, john Wiley &Sons, New York (1984)

8. Solid state chemistry , D. K. Chakrabarty, New Age Int. Pub., New Delhi,(2009)
9. Atomic Structure & chemical bond, Manas Chandra, Tata McGraw Hill, (1995)
10. Treatise on solid state chemistry Vol I, VII, B.N. Haney, Plenum Press, (1975)
11. Introduction to solids, L.V. Azaroff, Mc Graw Hill, (1960) S
12. The Crystal as A Super molecular Entity: Perspectives in Super molecular Chemistry, G.R. Desiraju, Wiley-VCH (1996)
13. Advanced physical chemistry by Gurtu n Gurtu
14. Principle of physical chemistry by Puri Sharma Pathania.
15. Advanced physical Chemistry By Gurdeep Raj.

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M.Sc. SEMESTER-III
Physical Chemistry
CHNN-602(P)
Paper-II

Unit 1: **25% (15 Hours)**

Reversible Cells: reaction in Reversible cells, Free Energy and heat changes in reversible cells, Amalgam cells, Activity coefficients from cells with transference, Quinine- hydroquinone system, Two stage oxidation reduction.

Liquid Junction : Liquid junction potentials of same electrolytes, General equation of liquid junction potential, Types of boundary, free diffusion junction , flowing junction , constrained diffusion junction

Electrolytic Conduction: Mechanism of electrolytic conductance (Debye Huckel Onsager Conductance equation) validity of DHO equation (Aqueous &non aqueous solution), Deviation of DHO Equation, Debye Falkenhagen effect and Wien effect,

Migration of ions: Transference number (True, apparent& Abnormal), Transference numbers in mixture, Factors effecting transference numbers, Methods for determining transference numbers.

Unit 2: **25% (15 Hours)**

Acids and Bases: Types of solvents, Dissociation constant, determination of dissociation constants of mono and poly basic acids by E.M.F. methods, colorimetric methods and conductimetric methods,

Effect of solvent on dissociation constant, Determination of ionic product of water by conductometric method and E.M.F. method.

Amphoteric electrolytes: properties of Dipolar ions, E.M.F methods for determination of dissociation constant of amino acids, proportion of dipolar ions, isoelectric point.

Neutralization curves for ampholytes, activity coefficient of ampholytes.

Unit 3: **25% (15 Hours)**

Over voltage: Theories of Hydrogen Overvoltage (Bubble formation, Combination of atoms as slow process, ion Discharge as the process, proton

transfer as the slow process), Factors effecting overvoltage, oxygen overvoltage, hydrogen overvoltage.

Polarisation: Electrolytic polarisation, Dissolution and decomposition potentials, metal deposition, concentration polarisation, Decomposition voltage in aqueous solution, Metal dissolution.

Reversible Oxidation and Reduction: Reversible Oxidation and Reduction process, nonreversible process, Factor effecting electrolytic reduction and electrolytic oxidation, Application of electrolytic oxidation and reduction.

Electro Organic Synthesis: complete cell design designer electrodes, polymerization of anions, Oxidation of Fatty acids, Brown-walker Electro synthesis.

Unit 4: 25% (15 Hours)

Electrophoresis and electro chromatography: principle, types, instrumentation and applications, capillary electrophoresis: Basic, Principle, instrumentation & Application.

Coulometry and amperometry: Basic, instrumentation & Application.

Polarography: Principle, wave equations, instrumentation & Application.

Voltametery (Cyclic Voltametery, Andodic stripping).

Books:

1. Modern Electrochemistry, J OM Bockeris/A.K.N. Reddy, Vol.1 and 2, third edition, plenum press,1977
2. Modern Electrochemistry, J OM Bockeris/A.K.N. Reddy, Vol.1,2 and 3, second edition, Springer,2008.
3. An introduction to electrochemistry, Samuel Glasstone, 10th edition, D. van Nostrand company, INC.1962
4. Erving's Analytical instrumentation hand book, edited by Jack cazes, Third edition, instrumental method of chemical analysis, Galen W. Ewing, Fourth edition, Mac Graw hill 1975.

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M.Sc. SEMESTER-III
Physical Chemistry
CHNN-603(P)
Paper-III

Unit 1: Introduction to Polymer 25% (15 Hours)

History, Classification on the Basis of Use and Chemical structure and geometrical structure, degree of Polymerization, Polydispersity, Average Molecular weight and molecular weight distribution, molecular Forces and chemical Bonding in Polymers.

Structure and Property relationship in fibres, elastomers and fibres

Naturally occurring polymers (Rubber, Asphaltenes, Shellac, Cellulose, Starch, Proteins, Nucleic acid, silk, wool)

Synthetic polymers (Buna S, Buna N , Thiokol, Rayon, Polyester Fibres, Inorganic and partially inorganic polymers)

Unit 2: Physical Properties of Polymers 25% (15 Hours)

Force in polymers: Molecular forces and bonding in polymers (primary and secondary forces), intermolecular forces and physical properities (volatility and molecular weight, miscibility and solubility),

Polymer structure and physical property: Crystalline melting point, properties involving small deformations, properties involving large deformations,

Glass Transition Temperature: Definition of Glass Transition Temp. (state of Aggregate & state of phase), Secondary glass transition temp. (state of Aggregate & state of phase), Secondary glass transition temperature, Factors effecting Tg, Relation Between Tm & Tg, The WLF equation, Methods for determination of Glass Transition Temp.

Unit 3: Mechanism and Kinetics of polymerization 25% (15 Hours)

Chain polymerization: Mechanism and Kinetics of Free Radical, Cationic & Anionic chain Polymerization,

Co-ordination polymerization: Ziegler –Natta Catalyst, Mechanism Of Ziegler-Natta polymerization (mono-metallic & Bio-metallic), early Kinetics models for Ziegler-Natta catalyst, Active centre.

Step Polymerization: Mechanism of step Polymerization, Polyfunctional step polymerization. Kinetics of Linear polycondensation polymerisation (Acid catalysed & Noncatalyzed) Ring opening Polymerisation: of cyclic ethers and cyclic amides.

Unit 4: Polymer Reactions **25% (15 Hours)**

Polymer degradation: Types of degradation, photo degradation, Mechanical degradation, Thermal degradation, oxidation degradation, Hydrolytic degradation.

Polymer Reactions: Acidolysis, Amino lysis, Addition, Substitution, Crosslinking and cyclisation Reaction.

Polymer solution: criteria of polymer solubility, conformations in polymer chains in solution, Entropy and heat of mixing of polymer solutions, phase equilibrium in polymer solutions.

Books:

1. Polymer chemistry: An introduction by Malcom P. Stevens, Indian edition, Oxford university press, London, 2011.
2. Introductory polymer chemistry, G.S. Mishra, New Age international LTD. Publishers, 2008.
3. Text book of polymers science, Fred W. Bill Meyer, a Wiley inter cience, Canada, New Delhi.1984.
4. Advanced polymer chemistry, manas Chandra, Marcell Dekker, New York,2000.
5. Speciality polymers, R.W. Dyson, Blackie Academic and professional, London1998.
6. Polymer science, V.R. Gawarikar, N.S. Viswanathan and J. Sreedhar, Wiley eastern.
7. Physical and Chemistry of Polymers J.M.G. Owe, Blackie Academic and professional.
8. Functional monomers and polymers, K. Takemotto, Ontabritte.

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M.Sc. SEMESTER-III
Physical Chemistry
CHNN-604 (P)
Paper-IV

Unit 1: Mass Spectrometry 25% (15 Hours)

Introduction ion production E1, C1 FD, ESI and FAB, factors affecting fragmentation, ion analysis, ion abundance, Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, meta stable peak. Me Lafferty rearrangement, nitrogen rule, High resolution mass spectrometry, Examples of mass spectral fragmentation of organic compounds with respect to their structure Determination.

Unit 2: X-ray Diffraction 25% (15 Hours)

Principle, Theory-X-ray spectral lines, X-ray tube emission, Bragg condition, Miller Indices, Laue method, Bragg Method, Debye-Scherrer method of X-ray structural analysis of crystals, index reflections, identification of unit cells from systematic absences in diffraction pattern, structural of simple lattices, X-ray intensities, structure factor and its relation to intensity, structure factor and electron density, chemical analysis using X-ray absorption, X-ray Fluorescence, chemical analysis, X-ray diffraction, Numerical problems.

Unit 3: The Liquid State & liquid crystals 25% (15 Hours)

The gaseous, liquid and solid state, the vacancy theory of liquid, the free volume of a liquid, physical properties of liquid, vapour pressure, surface tension, the Kelvin equation for vapour pressure of a droplet, Excess pressure in a drop, the Laplace equation and the Young-Laplace equation, surface active agents, viscosity, effect of temperature on viscosity, the Reynolds number, Molar refraction, Optical activity, ORD and CD, Structure of Liquids, Questions. Liquid Crystals, Vapour Pressure – Temperature diagrams, Thermography, LCDs and the seven segment cell, Nometic,liquid crystals, cholesteric liquid crystals, Disc shape liquid crystals, Polymorphism in thermotropic liquid crystals, pressure-induced mesomorphism, Molecular arrangements in various states of liquid crystal, Questions.

Unit 4: Photo electron & Photo acoustic spectroscopy 25% (15 Hours)

Introduction, principle, Instrumentation and application of following technique, Photo acoustic spectroscopy(PAS), photo electron spectroscopy, Koopman's THEROM,esca Andchemical information obtianded rom it, Augerelectron Spectroscopy(AES)

Books:

1. Spectroscopic method in Organic chemistry. Forth edition D. M. Williams and I.Fleming Tata-McGraw Hill, New Delhi, 1990.
2. Organic spectroscopy, Second Edition, W. Kemp, ELBS Macmillan,1987
3. Application of absorption spectroscopy of Organic Compound J. R. Dyer, Prentice Hall of India, New Delhi, 1984.
4. Spectroscopic identification of Organic Chemistry. Forth Edition R.M.
5. Spectroscopic Methods in Organic Chemistry. Forth Edition D.M. Williams and I. Fleming Tata –McGraw Hill, New Delhi,1990.
6. H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, Instrumental methods of Analysis, HCBS Publishing new Delhi;2004, 7th Ed.
7. C.N. Banwell and E.M. McCosh, Fundamentals of Molecular Spectroscopy, Tata –McGraw Hill, New Delhi; 4th Ed.
8. R.M. Silverstein, F.X. Webster; Spectroscopic identification of Organic compounds; Wiley-India; 6th Ed.
9. P.S. Kalsi; Spectroscopy of Organic compound; New Age International; 2Ed.
10. Principle of Physical chemistry. Puri Sharma Pathania.
11. Spectroscopic methods in Organic chemistry4th edition D.M Willaiams an L Fleming Tata MaGraw Hill, New Delhi 1990.

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M.Sc. SEMESTER-III
Physical Chemistry
CHNN-605 (P)-(A)-SE

Unit 1: **50% (15 Hours)**

(A) Atomic Absorption Spectroscopy

Introduction, Principle, Grotrain Diagrams, Detection of Non-metals by Atomic Absorption Spectroscopy, Difference Between Atomic Absorption Spectroscopy and Flame Emission Spectroscopy, disadvantage of atomic absorption spectroscopy, Instrumentation, Operation of Atomic Absorption Spectrometer, Single and Double beam Atomic Absorption Spectrometer, Detection Limit and Sensitivity.

(B) Flame Photometry

Introduction, Limitation of Flame Photometry, General principle of Flame Photometry, Instrumentation, Effect of Solvent in Flame Photometry, Instruments, Application of Flame Photometry, Limitation of Flame Photometry.

Unit 2: **50% (15 Hours)**

(A) Conductometric Measurements

Introduction, Some Important Lows, Definition and Relations, Effect of dilution, Conductance Measurements, Application of Conductance Measurements, Types of Conductometric Titrations, Advantage of Conductometric Titrations, Disadvantage of Conductometric Titrations.

(B) Measurement of pH

Introduction, Determination of pH, Ion selective electrode, Instrumentation, Application of pH Measurement.

(C) Potentiometric Titration

Introduction, Instrumentation, Types of Potentiometric Titration, Variation in Potentiometric Titration, Advantage of Potentiometric Titration.

Book:

1. Instrumental Methods of Chemical Analysis by Gurdeep R Chatwal, Sham K Anand Himalaya Publishing House.

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M.Sc. SEMESTER-III
Physical Chemistry
CHNN-605 (P)-(B)-SE

Unit 1: The Gaseous State (Ideal Gases): 50% (15 Hours)

The Kinetic Molecular Theory of gases, Pressure Of an Ideal Gas, Derivation of the gas laws, The ideal gas , equation, Kinetic energy and temperature, The Maxwell distribution Of molecular velocities, The Maxwell distribution Of molecular energies, Types of molecular velocities, Derivation of expression for molecular velocities, Expensive and compressibility, collision parameters, collision diameter, collision cross section, collision number, collision frequency, Mean free path, Transport Properties, thermal conductivity, Viscosity, Diffusion, Summary of transport properties in a gas, the degree of freedom of a gaseous molecules, the principle of equipartition of energy, Contribution to heat capacity of an ideal gas, The Barometric Formula, Questions and answers.

Unit 2: The Gaseous State (Real Gases) 50% (15 Hours)

Deviation of real gases from ideal behaviour, Explanation of deviation, Equation of state for real gases, The Vander Waal equation of state, Other equation of state, The virial equation of state, intra molecular forces, The Lennard – Jones (6-12) Potential, The second virial coefficient, the critical phenomena, P-V isotherm of carbon dioxide, The Vander Waal equation and critical state, Molar Mass and Density of real gas, Liquefaction of gas, Production of low temperatures by adiabatic demagnetization, Question and Problems.

Book:

1. Principle of Physical Chemistry ByPuri Sharma Pathania.
2. Advanced physical Chemistry By Gurdeep Raj.

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M.Sc. SEMESTER-III
Physical Chemistry- Practicals
CHNN-606-(P) & CHNN-607-(P)
Section –I (Minimum-05)

1. Determination of molecular radius of molecule of a molecule (organic liquid) using Refractrometer.
2. Determine Molar refractin of methyl acetate, ethyl acetate, n-hexane & CCl_4. Calculate the atomic reflactiion if C, H and Cl atoms.
3. Determine heat of transition and transition temperature for sodium sulphate decahydrate by thermometric methods.
4. Study the varitation of surface tention of solution of n-propyl alcohol with concentration and hence determine the limiting cross sectional area of alcohol molecule.
5. Titration of KI solution against $HgCl_2$ solution conductometrically.
6. Study the variation with composition of mixture of

a. Ethanol – Water, b. Methanol- ethylene diamine
Determine whether there is complex compound formation between two layers.

7. Determine the radius of molecule of sucrose by viscosity measurement.
8. Investigate solubility of component system & hence draw a tie line on binodal.
9. Separation of mixture of methylene blue Fluorescein on alumina column.
10. Separation of amino acids/proteins by electrophoresis.
11. Determine the ionzation constant of a weak acid (say Acetic acid) by conductometry.
12. Determine the strength of weak acid (CH_3COOH) by titrating it with a weak base (NH_4OH) conductometrically.
13. To study the effect of electrolytes on water structure by viscosity method.

Section –II (Minimum-05)

1. To Study the Influence of ionic strength on solubility of $CaSO_4$.
2. To Determine the isoelectric point of glycine by $_P$H metric.
3. Determine the standard electrode potential of Ag/Cu/Pb/Zn.
4. Estimate Na^+ or K^+ ion by flame photometer.
5. Separation of dyes TLC (any two)
   Malachite green Alizarin
   Crystal violet Methyl Orange

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Cresol Red	Congo Red
Fast green	Sunset Yellow
Rhodamine B	Pela Red

6. Determine velocity constant, order of reaction, energy of activation for saponification ethyl acetate by sodium hydroxide conduct metrically.
7. Determination of solubility of Lead sulphate/ barium sulphate conduct metrically,
8. Determination of CMC and Δ G of sodium dodecyl sulphate conduct metrically.
9. Polarograpohic determination of Pb^{+}, Cd^{2+}, or Cu^{2+} ions.
10. Fluorimetric determination of Al^{3+}, Cd^{3+}, Ca^{2+} or Zn^{2+}
11. To determine the Normality and Dissociation Constant of the given acid by Potentiometry.
12. To determine the equilibrium constant for the reaction between Ag^{+} and NH_3 by Potentiometry.

Section –III (Minimum-05)

1. Investigation the reaction between iodine and acetone.
2. Study Kinetics between potassium persulphate and potassium iodinde by differential method.
3. To determine the solubility of Calcium in Presence of different concentration of KCl/HCl.
4. Investigation the complex ion formation between Fe(III) and thiocynate ion by job's method using spectrophotometer and find out (i) free energy (ii) stability constant
5. Determine the composition of the following binary mixtures by using spectrophotometer or Colorimeter following Additives rules (any Two)
   a)$COCl_2$, $2H_2O$ + $NiCl_2$, $6H_2O$, b)Crystal violet + Aurine c)$K_2Cr_2O_7$ + $KMnO_4$
6. Determine the concentration of Fe (III) solution by titration with EDTA spectrophossstometrically.
7. Spectrophotometric determination of lead on Leaves using solvent extraction.
8. Determination inorganic phosphorus in human urine or serum specrophotometrically.
9. Spectrophotometric titration of copper and Bismuth mixture by EDTA.
10. Construct the phase diagram for three component system (chloroform-aceticacid-Water).
11. To determine the concentration and dissociation constant of a given di-basic acid by pH metric titration.
12. To determine the acidic and basic dissociation constant of a given amino acid and its isoelectric point by pH metry.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN-384265

Faculty of Science

M.Sc. Chemistry

Syllabus

Semester-IV

PROGRAM : HNGU 2058

W.E.F June-2020 (and thereafter)

CURRICULUM

Hemchandracharya

North Gujarat University,

Patan.

M.Sc. (Chemistry)

(WEF June: 2020)

I/c. Registrar
Hemchandracharya
North Gujarat University
PATAN

General Information of Semester III & IV

Syllabus According To CBCS Pattern

1. The medium of instruction, question papers as well as answers in examinations will be English only.

2. Passing standard: 40% as per the revised rules and regulation of Hemchandracharya North Gujarat University, Patan (ACA/AXS/744/2018, Date 27/4/2018).

3. Viva voice will be pertaining to practicals.

4. The degree will be awarded in M.Sc. (Chemistry) in specialized branch. The curriculum will be common for semester-III & IV for all branches.

5. The result sheet of all semesters will contain the name of elective papers selected by the candidate. The grade and the credit secured.

6. A maximum of 10% students passing second semester may be allowed for dissertation at the 4th semester. Such students will be exempted from practical as well as via of forth semester. In lieu of that the dissertation of candidate will be assessed with 100 marks of dissertation and 50 marks of the viva of dissertation.

If the number of students willing to opt dissertation exceeds 10% dissertation will be given on the basis of merit of combined marks of first and second semester. The dissertation will be allotted to the students in the beginning of third semester by head of the department / P.G. Center.

7. Intake of students every centre 40 (Organic branch) 25 for Inorganic & Physical branch, University Department.55 (Inorganic, Organic and Physical branches).

8. For semester III & IV

(A) The internal evaluation for total 120 marks will be done as per the continuous evaluation process as under.

	Marks
a) Weekly test of theory (minimum8)	56
b) Internal Practical examination (once a semester)	20
c) Students seminar (once a semester)	14
d) Problem Solving / New Practical	06
e) Book review(In students own handwriting ,Separate book for all) 07	
f) Project work assessment (separate for all)	07
g) Quiz/Questionnaire	10
	Total = 120
(B) SE Paper Internal Evaluation	15
	Total = 135

9. A batch of chemistry Practical will consist of 20 students per teacher.

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10. For semester III the papers, CHNN-601-(I), CHNN-602-(I), CHNN-603-(I), CHNN-604-(I), are core compulsory. Furthermore, students will have to choice any one of CHNN-605A-(I), or CHNN-605B-(I), Practicals CHNN-606-(I), & CHNN-607-(I).

11. For semester IV, the papers, CHNN-701-(I), CHNN-702-(I), CHNN-703-(I), and CHNN-704-(I), are core compulsory. In addition, the students will have to choice any one of CHNN-705A-(I), or CHNN-705B-(I), Practicals CHNN-706-(I), & CHNN-707-(I).

12. For all the semesters, the total marks will be given out of 600. The cumulative grade will be per university rules.

Note: During the preparation of this curriculum, samples are taken for consideration of the followings:

A. Model curriculum of U.G.C
B. Concept of continuous evaluation
C. CGPA(Cumulative Grade Point Average Credit)
D. CBCS(Choice Based Credit System)
E. Semester approach
F. Revised rules and regulation of Hemchandracharya North Gujarat University, Patan.
G. NET(NATIONAL ELIGIBILITY TEST) curriculum

13. As per recent directive from university, all the 4 credit as well as 2 credit courses will have internal marks as indicated in the table.

14. For university examination for each batch, maximum-30 students.

15. The mark distribution of 150 marks of practical will be as under from – (CHNN-606-(I), + CHNN-607-(I),M.Sc. SEM-III & CHNN-706-(I), + CHNN-707-(I),M.Sc. SEM- IV.

SECTION – I : 40 Marks
SECTION – II : 40 Marks
SECTION - III : 40 Marks
Viva : 30 Marks

Total: 150 Marks …….. (Two full days)

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Inorganic Chemistry

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Hemchandrcharya
North Gujarat University Patan
M.Sc. (Inorganic Chemistry) (WEF June:2020)
Semester-IV

Work Load	Paper No.	Subject	External Marks	Internal Marks	Credit
60 Hrs.	CHNN-701-(I)	Inorganic Chemistry Paper-I	70	30	4
60 Hrs.	CHNN-702- (I)	Inorganic Chemistry Paper-II	70	30	4
60 Hrs.	CHNN-703- (I)	Corrosion Or Co-ordination Chemistry	70	30	4
60 Hrs.	CHNN-704- (I)	Applications of Inorganic Chemistry in Industries	70	30	4
30 Hrs.	CHNN-705A- (I)	Fundamentals and Safety in Chemistry Lab	35	15	2
30 Hrs.	CHNN-705B- (I)	Bioinorganic Chemistry	35	15	2
90 Hrs.	CHNN-706- (I)	Practical- I	75	-------	3
90 Hrs.	CHNN-707- (I)	Practical- II	75	-------	3
		Total	465	135	24

- **Working per semester minimum 90 days (15 weeks).**

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M.Sc. Semester-IV
Inorganic Chemistry Paper-I
(Spectroscopy)
CHNN-701-(I)

Unit:-1 Mass Spectroscopy **25% (15 Hrs)**

Principles & Applications to Inorganic chemistry

Unit:-2 Electron Spectroscopy **25% (15 Hrs)**

EXAFS, ESCA, Auger Electron Spectroscopy

Unit:-3 Luminescence Spectroscopy **25% (15 Hrs)**

STM, AFM

-Luminescence Spectroscopy

Principles and Applications to Inorganic Chemistry.

Unit:-4 Inorganic photo Chemistry: **25% (15 Hrs)**

Introduction Photo Physical and Photochemical Laws & Kinetics, Photo Physical & Chemical Processes of Transition Metal Complexes. Photo isomerization of complexes.

Reference Books:

1. Spectroscopic Identification of Organic Compounds by R. M. Silverstein and F. X. Webster, 6th edition, John Wiley & Sons.
2. Introduction to Spectroscopy by D. L. Pavia, G. M. Lampman and G. S. Kriz, 3rd edition, Thomson Brooks/Cole.
3. Spectroscopic Methods in Organic Chemistry by D. H. Williams and I. Fleming, 4thedition, Mcgraw–Hill Book Company.
4. Organic Spectroscopy by William Kemp, 3rd edition, Palgrave.
5. Organic Spectroscopy–Principles and Applications by Jag Mohan, 2nd edition, Narosa Publishing House.

M.Sc. Semester-IV
Inorganic Chemistry Paper-II
(Polymers)
CHNN-702-(I)

Unit:- 1 Inorganic Polymers: 25% (15 Hrs)

Borazine or Borazole, substituted Borazines, boron nitride, silicones, poly Phosphonitrilic Chloride, Poly ortho Phosphoric acids. Boro phosphate glasses, Nitride of sulphur, Thiazyl halides, imides of sulphur.

Unit:-2 Co –ordination Polymers: 25% (15 Hrs)

Nature & reactions yielding co-ordination polymers Various use of Inorganic Polymers.

Unit:-3 Stereo chemistry of unusual co-ordination number. 25% (15 Hrs)

Definition,stoichiometry,stereo chemistry,establishment of structure by IR Spectra, Bonding and electronic structure.

Unit:-4 Molecular Polyhedra: 25% (15 Hrs)

Boron Hydrides &Higher boranes, three center bonds, basic assumptions, three center orbitals in known structures the equation of balance, topological theory its applications.

Books:

1. Polymer chemistry: An introduction by Malcom P. Stevens, Indian edition, Oxford university press, London, 2011.
2. Introductory polymer chemistry, G.S. Mishra, New Age international LTD. Publishers, 2008.
3. Text book of polymers science, Fred W. Bill Meyer, a Wiley inter cience, Canada, New Delhi.1984.
4. Advanced polymer chemistry, manas Chandra, Marcell Dekker, New York,2000.
5. Speciality polymers, R.W. Dyson, Blackie Academic and professional, London1998.
6. Polymer science, V.R. Gawarikar, N.S. Viswanathan and J. Sreedhar, Wiley eastern.
7. Physical and Chemistry of Polymers J.M.G. Owe, Blackie Academic and professional.
8. Functional monomers and polymers, K. Takemotto, Ontabritte.

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M.Sc. Semester-IV
Inorganic Chemistry Paper-III
(Co-ordination Chemistry)
CHNN-703-(I)

Unit:- 1 Methods of Coordination Compounds **25% (15 Hrs)**

Methods of Studying Coordination Compounds:
Molar Conductivities, Cyclic Voltammetry, X-ray Crystalography.

Unit:-2 Magneto Chemistry: **25% (15 Hrs)**

Introduction Origin of para-magnetism, Derivation o Van Vleck's equation, Calculation of magnetic susceptibility considering effect of spin-orbit coupling and magnetic fields as sequential perturbation. Ferromagnetism and Anti Ferromagnetism, Anti ferromagnetic exchange pathways, direct metal-metal interaction. Super Exchange Model, Magnetic susceptibility of binuclear Complexes.

Unit:-3 Complex Equilibrium: **25% (15 Hrs)**

Introduction, Computation of Stability constants from equilibrium data. Basic Principles, Mathematical functions and their melationships. Method of Computing stability constants. Half-integral n-values, correction term Method, Graphical methods. Numerical methods Experimental Determination of Composition and Stability, Solvent extraction. Ion exchange and Polarographic Methods.

Unit:-4 Applications of Coordination Compounds **25% (15 Hrs)**

Applications of coordination compounds in various fields.

Reference Books:

1. Advance Coordination Chemistry 1st Edition (English, Paperback, Shukla P R) Edition: 1st Edition, 2012 ISBN: 9789350515839, 9350515830
2. Inorganic Chemistry 3rd Edition 2008 by Donald A Tarr and Gary Miessler.
3. UGC Advanced Inorganic Chemistry (English, Paperback, Keemti lal, S.K. Agarwal) ISBN: 9789386306289, 938630628X

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M.Sc. Semester-IV
Inorganic Chemistry Paper-III
(Corrosion)
CHNN-703-(I)

Unit:- 1 Factors affecting on the corrosion of Iron Steel: 25% (15 Hrs)

Aqueous environment, Effect of dissolved oxygen, Temperature, pH, salts metallurgical factors, varities of Iron Steel, composition, heat treatment.

Unit:-2 Inhibitors and Passivstors: 25% (15 Hrs)

Theories of Passivity, Mechanism of Passivation, Application of Passivators. Packing inhibitors, Slushing compounds, vapor phase inhibitors.

Unit:-3 Cathodic and Anodic protection: 25% (15 Hrs)

Theory of Cathodic Protection, Methods of Cathodic and Anodic Protection.

Unit:-4 Corrosion Resistance: 25% (15 Hrs)

a. Coatings for corrosion resistance:
Methods of application, classification, Inorganic and Organic coatings.

b. Alloying for corrosion resistance:
Stainless steel,Monel metal, Incelel, Hastalloy.

Reference Books:

1. Handbook of Industrial Chemistry, Vol.1 by K.H.Davis, F.S.Berner, CBS Publishers,Bangalore.
2. Comprehensive Coordination Chemistry, Chapter 57, 58.
3. Insight into Speciality Inorganic Chemicals, Chapter 15, by David Thompson, The
4. Royal Society of Chemistry, 1995.
5. New Trends in Green Chemistry, 2nd Edition by V.K.Ahluwalia and M.Kidwai,
6. Anamaya Publishers, 2007.
7. Pietero Pedeferri Corrosion Science and Engineering Springer ISBN: 9783030073800

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M.Sc. Semester-IV
Inorganic Chemistry Paper-IV
(Applications Of Inorganic Chemistry IN Industries)
CHNN-704-(I)

Unit-1 :Pigments **25% (15 Hrs.)**

Introduction; Pigments in Foods-Naturally Occurring Plant-and Animal-Pigments; Synthetic Food Pigments Such as Sunset Yellow, Allura Red, etc; Pigments in Plants-raw materials for paints; Physical Properties of the Pigments in paints; Brief descriptions of the manufacturing process and use of commonly used pigments such as White Lead, Zinc Oxide, Titanium dioxide, etc.

Unit-2 Electrochemical Applications **25% (15 Hrs.)**

Introduction; Brief discussion on classical electro deposition of metals; Advancement in the electrochemical industry-modification of electrode surface, Brief discussion with respect to preparations and properties of surface modified Electrodes such as nafion modified electrodes, pvp modified electrodes, etc; Applications of surface modified electrodes such as Electro catalysis, ion selective electrodes, etc.

Unit-3 Corrosion Inhibitors **25% (15 Hrs.)**

Introduction, Types of corrosion Principles of Corrosion Inhibitors, Corrosion as an Electrochemical Process, Practical aspects of Corrosion Inhibition Anion inhibitor properties in neutral electrolytes, some application of corrosion inhibitors (cooling water circulation-ince through and open systems, engine radiation & cooling systems, central heating system, refrigeration plants and high chloride systems, water for steam raising, corrosion inhibitors for paint coating)

Unit-4 Waste and Waste Water Technology **25% (15 Hrs.)**
Water processing, Operation of Waterworks, Wastewater flows and Characteristics, Wastewater Collection Systems, Wastewater processing, Operation of Wastewater Systems, Advanced wastewater treatment, Waste reuse

Reference Books
1. Handbook ofIndustrial Chemistry,Vol.1 by K.H.Davis,F.S.Berner,CBS Publishers,Banglore.
2.Comprehensive Coordination Chemistry,Chapter 57,58.

3.Insight into Speciality Inorganic Chemistry,Chapter 15,by David Thompson,The Royal Society of
Chemistry,1995.
4.New Trends in Green Chemistry,2nd Edition by V.K.Ahluwalia and M.Kidwai,Anamaya Publishers,2007.

5. Water and Wastewater Technology,4th edition by Mark J.Hameer and Mark J.Hammer Jr.,Eastern
Economy Edition.
6. Wastewater engineering by Calf and Eddy.
7. Wastewater treatment for pollution control by Arceivala.
8. Manual on sewage & sewage treatment,Ministry of Works, Delhi.
9. Principles of water quality control by T.H.Y. Tebbut.

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M.Sc. Semester-IV
Inorganic Chemistry Paper-V
(Fundamentals & Safety In Chemistry Laboratory)
CHNN-705(A)- (I)

Unit-1 Complex Equilibria **50% (15 Hrs.)**

Types of Complex Equilibria in Solution and Equilibrium Constants: Basic Principles, Mathematical functions and their interrelationship. Statistical Considerations. Factors affecting the stability constants of metal complexes. Mixed ligand complexes.

Experimental methods for the determination of stability constants

Ion Exchange Methods, Polarography Methods. Solubility methods and least square method for computing stability constant.

Unit-2 Safety in chemistry laboratories **50% (15 Hrs)**

Good laboratory Practices: Elements of Good Laboratory Practices; Standard operating Procedures; Quality Assurance, Handling of Hazardous Materials, Toxic Materials(Various types of toxins and their effects on humans),Explosives and Inflammable Materials, Types of fire extinguishers, Bioactive materials, Recycling and Waste Disposal, Management in Chemical Laboratories. Legal provisions regarding Chemical Laboratories, Environment Protection Act, 1986

Reference Books:

1.Structure and Bonding,Vols. 1&6,Springer-Verlag.
2.Inorganic Chemistry by Phillips and Williams,Oxford.
3.Non-stoichiometric Compounds by L.Mandelcorn,Academic Press.
4.Inorganic Chemistry by K.F.Purcell and J.C.Kotz,Half-Saunders International Editions.
5.Boron Hydrides by William N.Lipscomb,Benjamin.Inc.

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M.Sc. Semester-IV
Inorganic Chemistry Paper-V
(Bioinorganic Chemistry)
CHNN-705(B)- (I)

Unit-1 BIOINORGANIC CHEMISTRY-I 50% (15 Hrs.)

The elements of living systems; The biological roles of metal ions. Calcium Biochemistry, Iron biochemistry, Nonmetals biochemistry Enzymes exploiting Acid Catalysis: Carbonic Anhydrase, Carboxy Peptidases.

Unit-2 Bioinorganic Chemistry-II 50% (15 Hrs.)

Redox Catalysis; Iron Sulphur Proteins and Non-Heme Iron, Cytochromes of the Electron transport chain,Cytochromes P-450 enzymes, Coenzyme B_{12} Blue Copper proteins Metals in medicine: Antibiotic and related compounds, Chelate therapy, Inhibition and Poisoning, Metal Complexes as Probes of Nucleic Acids.

Reference Books

1.Elements of Bioinorganic Chemistry,G.N Mukherjee and Arbindas.
2. Bioinorganic Chemistry, G.R.Chatwal and A.K.Bhagi.
3.Principles of Bioinorganic Chemistry, S.J.Lippard and J.M.Berst
4. Bioinorganic Chemistry,Bertini,H.B.Gray and S.J.Lippard.
5.Inorganic Chemistry, Shriver and Atkins.
6. Inorganic Chemistry,James E.huheey, Ellen A.Keiter and Richard L Keiter.
7.Bio-inorganic Chemistry,R.W.Hay-R.W.Hay,Ellis Horwood Limited Publishers chichester 1984
8.Metal ions in Biological Systems Ed by H.sigel Vol I to XIX,Marcel Dekker, Basel .
9.Principles of Bio Inorganic Chemistry, S.J.Lippard and J.M. Ber University Science Books 1994
10.Facets of coordination chemistry Ed by B.V.Agarwala & K.N.Munshi World Scientific, Singapore,
NJ,London
11.Bioinorganic Chemistry, Bertini, Gray, Lippard & Valentin Viva books pvt Ltd (1998)
12.BioInorganic Chemistry an introduction, J.A.Cowan, Wiley-VCH

M.Sc. Semester-IV
Inorganic Chemistry Paper-V
(Practicals)
CHNN-706-(I) & CHNN-706-(I)

1. **Ore and Alloy analysis (at Least six)**

2. **Preparation of complexes and their analysis (any four)**

a. Preparation of sodium cobaltinitrite and estimation of cobalt.
b. Preparation of potassium trioxalato chromite and estimation of Chromium.
c. Preparation of potassium tri-oxalato-aluminate and estimation of Aluminium.
d. Preparation of N,N bis(salicylaldehyde) ethylene diamine and its Cu complex and estimation of Cu.
e. Preparation of N,N bis(salicylaldehyde) ethylene diamine and its Co complex and estimation of Co.
f. Preparation of N,N bis(salicylaldehyde) ethylene diamine and its Ni complex and estimation of Ni.

3. **Spectrophotometric Determination:**

a. Determination of Iron spectrophotometrically by 1,10 phenanthrolin method.
To determine the amount of Ir

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Organic Chemistry

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North Gujarat University Patan
M.Sc. (Organic Chemistry) (WEF June: 2020)
M.Sc. Semester-IV

Work Load	Paper No Course Code	Subject Course Title	External Marks	Internal Marks	Credits
60 Hrs.	CHNN-701-(O)	Natural & Stereo Chemistry	70	30	4
60 Hrs.	CHNN-702-(O)	Industrial Organic Chemistry	70	30	4
60 Hrs.	CHNN-703-(O)	Synthetic Drugs	70	30	4
60 Hrs.	CHNN-704-(O)	Selected Topic In Chemistry	70	30	4
30 Hrs.	CHNN-705A-(O)	Disconnection Approach	35	15	2
30 Hrs.	CHNN-705B-(O)	Chemical Toxicology & Solid Waste	35	15	2
90 Hrs.	CHNN-706(O) A Practicals	Organic Chemistry	75	-------	3
90 Hrs.	CHNN-706(O) B Practicals	Organic Chemistry	75	-------	3
		Total	465	135	24

- **Working per semester minimum 90 days (15 weeks).**

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M.Sc. Semester-IV
Chemistry Paper-I
Natural & Stereo Chemistry
CHNN-701-(O)

Unit1: Purine & Nucleic Acid: 25% (15 Hours)

Purine & Nucleic Acid: Chemistry of Uric acid, Adenine, Caffeine, Structure of Nucleotides, Nucleosides, DNA, RNA and Conformations, Protein Synthesis, Prebiotic Chemistry.

Unit 2: Carbohydrates: 25% (15 Hours)

Types of Naturally Occurring Sugars, Dexoy Sugars, Amino Sugar, General Method of Structure and Ring Size Determination with Reference to Starch and Cellulose, Photosynthesis of Carbohydrates.

Unit 3: Steroids: 25% (15 Hours)

General Biosynthesis Studies of Steroids, Chemistry of Ergosterol and Lanosterol

Androgens: Oestrone, Oestriol and Oestradiol

Gestogens: Progesterone Adreno Cortical Hormones: Cortisone, Diosgenine and its Utility in Hormone Synthesis, Transformation in Steroids Molecules.

Unit4: Conformational Analysis: 25% (15 Hours)

Conformation of Monocyclic System:

Cyclo Propane: Cyclopropane1,2 Dicarboxillic Acid, 2-OH Methyl Cyclo Propane Dicarboxillic acid,

Cyclo Hexane:1,3 Ditertiary Butyl Cyclohexane, 4-OH Cyclo Hexane Carboxylic Acid, Cyclohexane 1,2 di Carboxylic Acid.

Cyclo Hexanone: 2-Br Cyclo Hexanone, 2-Br 4,4-dimethyl Cyclo Hexanone, Cyclo Hexanol, Hexa-Chloro Cyclo Hexane, Conformation of Di substituted Cyclohexaenones,

Bridge ring system: Bicyclic(1,1,1) pentane and Bicyclo (2,1,1) hexane, Bicyclo (2,2,1) Heptane and Bicyclo (2,2,2) Octane.

Fused Ring System : Per hydro Anthracene and Per Hydro Phenanthrene.

Basic Text & Reference Books:

1. Natural Products by O.P. Agarwal, Vol. 1 & 2
2. Organic Chemistry of Natural Products by G.R. Chatwal, Vol. 1 & 2
3. NMR Spectroscopy : Basic Principles, Concepts and Applications in Chemistry , 3rd edition by Harald Gunther
4. Spectroscopic Identification of Organic Compounds, R. M. Silverstein and F. X. Webster, 6th edition (John Wiley & Sons)
5. Introduction to Spectroscopy, D. L. Pavia, G. M. Lampman and G. S. Kriz, 3rd edition (Thomson Brooks/Cole)
6. Spectroscopic Methods in Organic Chemistry, D. H. Williams and I. Fleming, 4th edition (Mcgraw – Hill Book Company)
7. Organic Spectroscopy, William Kemp, 3rd edition (Palgrave)
8. Organic Spectroscopy – Principles and Applications, Jag Mohan, 2nd edition (Narosa Publishing House)
9. Spectroscopy of Organic Compounds, P. S. Kalsi, 5th edition (New Age International Publishers)
10. Stereochemistry: Conformation and Mechanism, By P.S. Kalsi, 6th edition, New Age International (P) Ltd., Publishers (2005).
11. Stereochemistry and Mechanism through solved problems, By P.S. Kalsi, Wiley Eastern Ltd. (1994).
12. Stereochemistry of organic compounds, By D. Nasipuri, 2nd Edition, New Age
13. International (P) ltd., Publishers (1994).
14. Stereochemistry of Carbon Compounds, By E.L. Eliel, Tata McGraw-Hill Pub. Co. Ltd. (1962).
15. Organic Chemistry, By J. Clayden, N. Greeves, S. Warren and P. Wothers, Oxford Uni. Press, N.Y. (2001).
16. Elementary Organic Spectroscopy: Principles and Chemical Applications (revised edition), Y. R. Sharma (S. Chand Publishing)

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M.Sc. Semester-IV
Organic Chemistry Paper-II
Industrial Organic Chemistry
CHNN-702-(O)

Unit 1: Synthetic Industries Based On Petroleum: 25% (15 Hours)

Coal, Petroleum, Natural Gas, Organic Chemicals from Coal Distillation, Refining of Crude Oil FCR Industrial Fuels, C_1, C_2, C_3, C_4 and Aromatic Chemicals. Textile Fibers Classification, Manufacture of Important Polyamide, Poly Ester Fibers.

Unit 2: Paints & Varnish, Explosive 25% (15 Hours)

Paint: Industries Paint and Varnish Classification of Paints, Manufacture of Paints. Methods of Applying Paints.
Varnish: Raw Materials Manufacture of Varnishes, Types of Varnishes.
Explosives: Propellants and Toxic Chemical Agents.
Types of Explosives, Characteristics of Explosive, Industrial Explosives, propellants, Rocket and Missiles, Propellants for Rocket, Miscellaneous Industrial Explosives Uses, Pyrotechnics, Military Explosives, Incendiaries, Toxic Chemical Agents (Weapons).

Unit 3: Industrial Polymers 25% (15 Hours)

Introduction of Polyethylene's, Manufacture of Polyethylene, Low and High Density Polyethylene co-oplymers of Ethylene and Application.

Monomers, Dacron, Orlon, Bakelite, Nylone 6,6 Teflon Polymer Reactions, Hydrogenation, Addition and Substitution Aldehyde and ketonic Group Reactions. Cyclisation, Cross linkage Reaction.

Resins: Introduction & Preparation of Resins, Mechanism Type of Resin, Application

Acrylic Polymer

1) Poly acrylate and Poly methylated acrylate,
2) Poly Methyl Methacrylate
3) Poly Acrylonitrile

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Unit 4: Selected Small Scale Industries: **25% (15 Hours)**

Safety Matches, Agarbatties, Naphthalene balls, Candles, Shoe Polish, Gum paste, Pen Ink, Removal of Stains, Phenol disinfectant Soaps, Detergents.

Basic Text & Reference Books:

1. Industrial Chemistry by B.K. Sharma
2. Shereve's Chemical Process Industries by George T. Austin
3. Industrial Organic Chemistry by Klaus Weissemann

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M.Sc. Semester-IV
Organic Chemistry Paper-III
Synthetic Drugs
CHNN-703(O)

Unit 1: Chemotherapeutic Drugs 25% (15 Hours)

Antimalarial Agents: Chemotherapy of Malaria, Malaria Parasite and it's cycle, 4-aminoquinolines, 8-aminoquinolines, 9-aminoacridines, Di-amino pyrimidine's, Antimoebic Drugs, Anti-viral drugs and Anti-Cancer drugs

Unit 2: CNS Drugs or Psychopharmacological Agents: 25% (15 Hours)

Antipsychotics, Antidepressant, Antianxiety, Hallucinogenic Drugs, Anti Convulsants, Hypnotics & Sedative, Anti Parkinsonism Drugs,

Unit 3: Cardiac & Diuretics Drugs: 25% (15 Hours)

Drugs acting on the Cardiovascular, Hypertensive Drugs, Haematopoeic and Renal Systems Cardiac drugs, diuretics.

Unit 4: Miscellaneous Drugs: 25% (15 Hours)

Anti-diabetic Dugs (Hypoglycemic Drugs) & Anti-Bacterial, Antituberrcular and Antileprotic Drugs, Antifungal Drugs

Basic Text & Reference Books:

1. Medicinal Chemistry by Ashutosh Kar
2. Medicinal Chemistry by G. R. Chatwal
3. Medicinal Chemistry by D. Shriram
4. Synthetic Organic Chemistry O P Agarwal
5. Synthetic Drug J J Trivedi & K A Thakar
6. Synthetic Drug by Anamik Shah
7. Medicinal Chemistry by

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M.Sc. Semester-IV
Organic Chemistry Paper IV
Selected Topic In Chemistry
CHNN-704

Unit-1: Molecular Rearrangements-1 25% (15 Hours)

Rearrangement to electron deficient atoms,

(A) Rearrangement to electron deficient carbon

(1) Pinacol Pinacol rearrangement
(2) Wangermeerwin rearrangement
(3) Wolf rearrangement

(B) Rearrange to Electron Deficient Nitrogen

(4) Hofmann rearrangement
(5) Curtius rearrangement
(6) Beckmann rearrangement

(C) Rearrangement to Electron Deficient Oxygen

(7) Baeyervilliger Reaction,
(8) Dakin Reaction

Unit-2 Molecular Rearrangements-2 25% (15 Hours)

(A) Rearrangement to electron deficient carbon
Stevens rearrangement, Witting rearrangement, Favorskii rearrangement
(B) Aromatic Rearrangement
Hofmann Martius rearrangement, Claisen rearrangement, Cope rearrangement
Benzidine rearrangement, Fries rearrangement

Unit-3 Organo Metallic Compounds 25% (15 Hours)

Organo Magnesium Compounds, Organo Aluminum Compounds, Organo Cadmium Compounds, Organo Silicon Compounds, Organo Lithium Compounds,

Unit-4 Name Reactions 25% (15 Hours)

Cannizaro Reaction, Dieckman Reaction, Fischer Indole Reaction, Leuckart Reaction, Reformastky Reaction, Witting reaction, Pechmann Reaction, Dilesalder Reaction, Wolfkishner Reduction, Friedel-Crafts Reaction, Reimertiemann Reaction,

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Basic Text & Reference Books:

1. Organic Chemistry Reaction and Reagents O. P. Agarwal

2. Organic Chemistry by J. Clayden, N. Greeves and S. Warren, 2nd edition, Oxford University Press, UK.

3. Modern Methods of Organic Synthesis; W. Carruthers and I. Coldham, 4th edition, Cambridge University Press, UK.

4. Name Reaction for Functional Group Transformation, E. J. Corey and Jie Jack Lie, John Wiley and Sons, New Jersey.

5. Name Reactions, Jie Jack Lie, 4th edition, Springer, New York.

6. Selected Organic Synthesis, Ian Fleming, John Wiley & Sons, New Jersey.

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M.Sc. Semester-IV
Organic Chemistry Paper-V
Disconnection Approach
CHNN-705 (A)
Subject Elective

Unit-1: Disconnection Approach **50% (15 Hours)**
Introduction and definition of disconnection, Synthon, Sytnhetic equivalents, Disconnection Approach, Functional Group Inter Conversion, used in disconnection. The importance of order of events in organic synthesis, One and two C-X group disconnection, and Synthesis of Amine, Reversal of Polarity.

Unit-2: Protecting Groups & Reactions: **50% (15 Hours)**
Protection of organic functional groups, Protecting Reagents and Removal of Protecting. Protection of Amine, Alcohol, Carbonyl and Carboxylic Acid Groups. Suzuki Reaction, Smith Reaction, Sharpless Epoxidation Reaction, Heck Reaction Micheal addition and Robinson Annulation.

Basic Text & Reference Books:-

1. Designing Organic Synthesis – A Programmed Introduction to the Synthon Approach, Stuart Warren, John Wiley & Sons (1994).
2. Organic Synthesis: The disconnection approach, Stuart Warren, John Wiley & Sons (1994).
3. Selected Organic Synthesis, Ian Fleming, John Wiley & Sons (1977).
4. Organic Chemistry, 2nd edition by Jonathan Clayden, Nick Greeves & Stuart Warren, Oxford University Press.
5. Modern Methods of Organic Synthesis, 4th edition by W. Carruthers & Iain Coldham, Cambridge University Press.
6. Modern Organic Synthesis: An introduction by George S. Zweifel & Michael H.
Nantz, W. H. Freeman & Company.
7.Greene's Protective Groups in Organic Synthesis, 4th edition, by P. G. M. Wuts and T.W. Greene, Willey Interscience.
8. Organic Chemistry by J. Clayden, N. Greeves and S. Warren, 2nd edition, Oxford University Press, UK.
9. Modern Methods of Organic Synthesis; W. Carruthers and I. Coldham, 4th edition, Cambridge University Press, UK.
10. Name Reactions, Jie Jack Lie, 4th edition, Springer, New York.

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M.Sc. Semester-IV
Organic Chemistry Paper-VI
Organic Chemical Toxicity & Solid Waste Management
CHNN-705 (B)
(Subject Elective)

Unit-1: Chemical Toxicology 50% (15 Hours)

Toxic Chemicals in the Environment, Impact of Toxic Chemical on Enzymes, Biochemical Effects of Cadmium, Lead, Arsenic and Mercury, Minamata Epidemic in Japan, Biological Methylation , Amplification of Mercury in food Chain, Biochemical Effects of Ozone, PAN, Cyanide and Methyl Isocyanate, Biochemical Effects of Pesticides and Carcinogens, Solution to Environmental Problems, Preventive Environmental Managements, Industrial Ecosystem and Better Industrial Process, Kalundborg Industrial Ecosystem.

Unit-2: Solid Waste Management, Treatment & Recycle 50% (15 Hours)

Classification of Solid Waste, Objective of Solid Waste Management, Characteristics of Solid Waste, Municipal Solid Waste Treatment, Automatic System of Composting, Vermi Composting, Sanitary Land Fill, Incineration, Auto Thermal Incineration of dewatered sludge, industrial solid waste treatment, High Temperature Incineration, Pyrolysis and Vitrification, Solid waste management by biotechnology, Biomedical Waste and its treatment, Recycling, Recovery, and Reuse of Paper, Glass and Plastics, Recovery of Metal Ions, and Waste Oil.

Basic Text & Reference Books:

1. Environmental Chemistry H Kaur Pragati 8st Edition 2014 ISBN:978-93-5140-060-8

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M.Sc. Semester-IV
Organic Chemistry Practicals
CHNN-706 (O) & CHNN-707 (O)

1) Organic Separation:

Separation, purification and Identification of three compounds (Trinary Mixture) 10 grams organic mixture by semi micro method- preparation of derivative. (Minimum Five mixtures should be done).

2) Organic Estimation (Semi micro Methods):

1. Estimation of Isoniazid
2. Estimation of Ibuprofen
3. Estimation of Paracetamol by hydrolysis
4. Estimation of Diazepam by non aqueous titration
5. TLC of Drugs

3) Organic Preparation:

Two & Three stage preparation from 4 & 5 grams starting materials semi micro method (Minimum five should be done) including name reactions.

Spectroscopic Problems: Identification of Organic Compound by either spectral data or actual spectra (Combined UV-Visible, Mass, IR, ^{1}H NMR,^{13}C NMR).

Basic Text & Reference Books:

1.Vogel's Textbook of Practical Organic Chemistry, 5th edition, B. S. Furniss, A. J.Hannaford, P. W. G. Smith, A. R. Tatchell (Pearson Education)
2. Comprehensive practical organic chemistry: Qualitative analysis, V. K. Ahluwalia, Sunita Dhingra (Universities Press)
3. Organic Structures from Spectra, 5th edition, L. D. Field, S. Sternhell, J. R. Kalman (Wiley: A John Wiley & Sons Ltd publication)
4. Elementary Organic Spectroscopy: Principles and Chemical Applications (revised edition), Y. R. Sharma (S. Chand Publishing)

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Physical Chemistry

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M.Sc. (Physical Chemistry) (New Syllabus WEF June: 2020)
M.Sc Semester-IV

Work Load	Paper No	Subject	External Marks	Internal Marks	Credits
60 Hrs.	CHNN-701-(P)	Physical Chemistry	70	30	4
60 Hrs.	CHNN-702-(P)	Physical Chemistry	70	30	4
60 Hrs.	CHNN-703-(P)	Physical Chemistry	70	30	4
60 Hrs.	CHNN-704-(P)	Physical Chemistry	70	30	4
30 Hrs.	CHNN-705A-(P)	Physical Chemistry	35	15	2
30 Hrs.	CHNN-705B-(P)	Physical Chemistry	35	15	2
90 Hrs.	CHNN-706-(P) Practicals	Physical Chemistry	75	-------	3
90 Hrs.	CHNN-707-(P) Practicals	Physical Chemistry	75	-------	3
		Total	465	135	24

- **Working per semester minimum 90 days (15 weeks).**

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M.Sc. Semester -IV
Physical Chemistry
CHNN-701(P)
Paper-1

Unit:-1 Photo Chemistry-2 **25% (15 Hours)**

Basics: Nature and importance of singlet and triplet oxygen, Photochemical equivalence and photo stationary states (with examples), consequence of light absorption (Jablonski diagram, radiative, non-radiative and chemical reactions, Frank codon principle, Anti stroke behaviour.

Florescence: Theory of Florescence, Relation between Florescence intensity and concentration,

Quenching of Florescence, Kinetics of Quenching of Florescence (Photo peroxidation reaction),

Factors affecting Quenching of florescence, Difference between fluorescence, Phosphorescence and Chemiluminescence.

Mechanism of Reaction: Ene reactions, Cycloaddition reactions, Reduction reaction, Radiolysis of water photo conductivity, CO_2 reduction

Energy conversion and storage: Photo sensitizers, Transition metal complex, Metal complex sensitizers, reaction sensitized by Mercury, Chlorine, Excimers and Exciplexes.

Unit:-2 The Colloidal State **25% (15 Hours)**

Colloidal systems:

Classification of colloids: Liophobic and Liophilic sols.

Preparation of hydrophobic colloidal solutions: despertion methods and condensation methods

Purification of colloidal solutions:

Properties of colloidal systems: (1) Electrical properties: Charge on colloidal particles, the electrical

double layer, DLVO theory of the stability of liophobic colloids, coagulation of colloidal solutions

(2) Electro kinetic properties: Electrophoresis and electroosmosis

Determination of size of colloidal particles

Surfactants (Surface-active agents)

Hydrophile- Lipophile balance (HLB): (1) Micelle formation: The mass action model and the phase separation model, shape and structure of micelles, micellar

aggregation numbers, the critical micelle concentration (CLC), factors affecting CMC in aqueous media, thermodynamic approach to CMC, thermodynamics of Micellization, Micelle concentration range (MTR) or Kraft point

Solubilisation: Location of solubalizates in micelles, the phase rule of solubilisation, Emulsification by surfactants: Macro emulsions, factors determining stability of emulsions, microemulsions

Theories of Emulsions: (1) Qualitative theories Bancroft rule (2) Quantitive theories, The selections of surfactants as emulsifying agents, Gels and their preparations, Importance and applications of colloids.

Unit:-3 Chemical Kinematics 25% (15 Hours)

Theories of reaction rates: Kinetic theory of collision, Rate theory of based on statistical mechanics, early dynamical theories and CTST

Unimolecular reactions: Perrin, Lindmann-Christiansen, Hisnhel wood, RRK, RRRM and Slater,

Conventional transition state theory

Chain reactions: Features and kinetics of chain reaction, autooxidation, kinetics of branched chain

reactions, explosion limits, a kinetic isotope effect (primary and secondary)

Reactions in solutions: Theory of absolute reaction rate, applicable to reaction in solution (Ideal and real solution), Linear free energy relationship and Hammett equation, Deviation from Hammett equation. Significance of and p

Examples: kinetics of organic decomposition of CH_3CHO, butane, reaction between H_2 and O_2.

Unit 4:- Spectroscopy 25% (15 Hours)

UV-visible: principle, instrumentation, determination of pK value of indicator, and instability constant, qualitative and quantitative analysis.

Raman Spectroscopy: Raman effect, difference from IR and fluorescence, nature of spectra, selection rule, basic instrumentation and applications.

Atomic absorption spectroscopy: Basic principle, advantages over flame emission spectroscopy, basic instrumentation and applications

Emission spectroscopy: Basic principle, radiative and non-radiative decay, internal conversion, basic instrumentation and applications.

Books:-

(1) Fundamentals of photochemistry, R.K. Rohatgi and Mukherji, Tata McGraw Hall

(2) Essentials of photochemistry, A. Gilbert and J. Baggott, Black well scientific publishers
(3) Introductory Photochemistry, A. Cox and T camp, McGraw Hall
(4) Organic photochemistry, J. Coxon and B. Hilton, Cambridge university press
(5) Essentials of nuclear chemistry, Hari Jeevan Arnikar, New Age international (1995)
(6) Nuclear and radiochemistry (3rd edition), Gerhart Friedlander, Joseph W. Kennedy, Edward
S. Macias and Julian Malcolm Miller, John Willey and Sons publications
(7) Modern Nuclear Chemistry, Walter D. Loveland, David J. Morrissey and Glenn T. Seaborg, John Willey and sons publications
(8) Handbook of nuclear chemistry (2nd edition): VOL.1: Basics of nuclear science; VOL.2: elements and isotopes formation, transformation, distribution, edited by Attila Vertis, Sandor Nagy, Zoltan Klencsar, Rezso Gyorgy Lovas, Frank Rosch, Springer publications.
(9) Principle of Physical Chemistry by Puri Sharma Pathania
(10) Chemical Kinetics, Keith J. Laidler, McGraw Hill
(11) Modern spectroscopy, J.M. Hollas, McGraw Hill
(12) Basic principles of spectroscopy, H. Chang, McGraw Hill
(13) Spectroscopy methods of organic chemistry, D.H. Williams and I. Fleming, tata McGraw Hill
(14) Spectroscopy, P.S. Kalsi, Pragati Prakashan, 1998.
(15) Advanced physical Chemistry By Gurdeep Raj.

M.Sc. Semester -IV
Physical Chemistry
CHNN-702(P)
Paper-II

Unit:-1 Solvation and Solvent Effects: 25% (15 Hours)

Qualitative understanding of solvent-solute effects on reactivity. Thermodynamic measure of solvation. Effects of solvation on reaction rates and equilibria.

Various empirical indexes of solvation based on physical properties, solvent sensitive reaction rates, spectroscopic properties and scales of specific salvation, use of salvation scales in mechanistic studies. Solvent effects from the curve crossing model.

Electrochemistry of material science: Corrosion of ultrapure material, cathodic reaction in corrosion, thermodynamics and stability of metals, uses and abuses of Poubaix diagram, corrosion and Evans diagram, methods of studying corrosion, types of corrosion, inhibition of corrosion, passivation and depassivation. Corrosion of iron in presence and absence of oxygen.

Unit:-2 Ionic liquids: 25% (15 Hours)

Definition, features of ionic liquids, models of ionic liquids (lattice-oriented models and gas-oriented models), solvent properties of fused nonmetallic oxides, fused oxide system in metallurgy.

Protons in solution: conditions of proton solvation, heat of hydration of proton, proton transport (abnormal mobility of proton, conduction by chain reaction, quantum mechanical proton jumps), proton mobility in ice.

Electrochemical energy conversion and storage: Electrochemical generator (Hydrogen oxygen cell, hydrocarbon air cells, natural gas co air cells, dissolved fuel air cells), quantities of electricity storage (storage density, energy density and power), electricity storage using alkali metals and non-aqueous solutions.

Unit:-3 Electro Kinetic Phenomena: 25% (15 Hours)

Electroosmosis, streaming potential, electrophoresis, determination of Zeta potentials, Zeta potentials, influence of ions on electro kinetic phenomena, electrophoretic mobility and bound hydrogen ion.

Quantum aspects of charge transfer: quantum aspects of charge transfer reaction or electrode solution interface, mechanics of electron, penetration of electrons in to classically forbidden regions, probability of electron tunneling through barriers, tunneling condition and proton transfer curve, de-elections, reaction. A symmetry factor B.

Bio electro chemistry: electrical conduction in biological cells (electronic, protonic), electrochemical mechanism in neurons, interfacial electron transport in biological systems, conduction and electron transport in biological systems.

Unit:-4 Solutions of Non-Electrolytes: 25% (15 Hours)

Solutions of liquids in liquids, Raoult's law, Vapor pressures of ideal solutions

Activity of component in an ideal solution, Chemical potentials of ideal and non-ideal solutions, Gibbs-Duhem-Margules equation, Temperature dependence of vapor pressure of solution, Thermodynamics of ideal solutions, Free energy change of mixing for an ideal solution, Volume change and enthalpy change of mixing for an ideal solution, Entropy change of mixing for an ideal solution

Pressures of non-ideal solutions, Pressure composition and boiling point

Composition curves of completely miscible binary solutions, Fractional distillation of binary liquid solutions, Azeotropic mixtures, Lever rule and fractional distillation, Distillation of immiscible liquids, Solubility of partially miscible liquids, UCST and LCST, Phenol-water system, Aniline-hexane system

Triethylamine-water system, Nicotine-water system, Solutions of gases in liquids, Factors influencing solubility of a gas, Henry's law, Henry's law and Raoult's law Questions and problems

Books:

(1) Modern Electrochemistry, J OM Bockeris / A.K.N. Reddy, vol. 1 and 2, third edition, plenum press,1977
(2) Modern Electrochemistry, J OM Bockeris / A.K.N. Reddy, vol. 1,2 and 3, second edition, springer, 2008
(3) An introduction to electrochemistry, Samuel Glasstone, 10th edition, D. van Nostrand company, INC 1962
(4) Evings analytical instrumentation handbook, edited by Jack Cazes, third edition, Instrumental methods of chemical analysis, Galen W. Ewing, fourth edition, Mac Graw hill 1975

M.Sc. Semester -IV
Physical Chemistry
CHNN-703(P)
Paper-III

Unit:-1; Structure of Polymers 25% (15 Hours)

Chemical structure and properties of polymers: Mechanical properties, Thermal stability, flammability and flame resistance, chemical resistance, degradability, electrical conductivity, Optical properties.

Copolymerization: Nomenclature of Co-Polymers with examples (Unspecified, Statistical, Alternate, Ideal, Random, Block and Graft) Kinetics of free Radical copolymerization, Binary co-polymerization equation, Composition of copolymers, Reactivity Ratios, Q-e scheme. Polymer blends, some common copolymers (Ethylene copolymers, styrene copolymers, vinyl chloride copolymers)

Unit:-2: Synthesis of Polymers and Molecular Weight determination 25% (15 Hours)

Methods of Synthesis: Bulk polymerization, precipitation, Emulsion polymerization, Suspension polymerization, Interfacial polymerization,

-Methods for determination of average molecular weight of polymer: Colligative Property measurement, Light scattering methods, dilute solution viscometry, ultra-centrifugation, mass spectrometry, refractive index measurements.

-Weight Distribution Methods: Gel permission chromatography, fractional solution, fractional precipitation, gradient elution, TLC.

Unit :- 3; Polymer Morphology and Processing 25% (15 Hours)

Crystallinity in polymer: Degree of crystallinity, determination of crystallinity, morphology of crystalline polymer (Lamellae, Spherulites, Helix)

-Rheology of polymers: Hook's equation, Newton equation, Maxwell, Voigt model, Burger Model, Deformation behaviour of materials, relaxation and retardation.

-Polymer processing: Compounding, Casting, Moulding, Foaming, Rein forcing, Fibre spinning,

Unit :- 4; Characterisation, Analysis and Testing of Polymers

25% (15 Hours)

Chemical Analysis, -Spectroscopic Analysis (IR, Raman, NMR, ESR, UV visible, fluorescence), -X-Ray Diffraction Analysis, -Thermal Analysis (TGA, TMA, DSC, DTA), -Physical Testing (Mechanical Properties, Thermal Properties, Optical properties, Electrical Properties)

Books:

1. Polymer chemistry: An introduction By Malcom P. Stevens, Indian edition, 3rd edition, oxford university press, London, 2011
2. Introductory polymer chemistry, G.S. Mishra, New age international LTD. Publishers, 2008
3. Textbook of polymer science, Fred W. Bill Meyer, a Wiley inter cience, Canada, New Delhi, 1984
4. Advanced polymer chemistry, Manas Chandra, Marcell Dekker, New York, 2000
5. Speciality polymers, R.W. Dyson, Blackie Academic and professional, London, 1998
6. Polymer science, V.R. Gawarikar, N.S. Viswanathan and J. Sreedhar, Wiley Eastern
7. Physics and chemistry of polymers, J.M.G. Cowe, Blackie Academic and professional
8. Functional monomers and polymers, K. Takemotto, Ontabritte, Introduction Of polymers, R.J. Yuan and P.A .Lovell, 2nd edition, nelso thrones LTD, 2002.

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M.Sc. Semester -IV
Physical Chemistry
CHNN-704(P)
Paper-IV

Unit 1: Chemistry of Nanomaterial's **25% (15 Hours)**

Classification and nomenclature of nanomaterials: Nanosized metals and alloys, semiconductors, Organic semiconductors, Carbon materials; Zero-, One, Two and Three dimensional nanostructures-Quantum dots, Quantum wells, Quantum rods, Quantum wires, Quantum rings; Synthesis of nanomaterials (Nucleation and growth of nano systems; self-assembly, mechanical Milling, Chemical reduction and oxidation, Hydrothermal, Micelles, Sol-Gel processes, photolysis, radiolysis) Designing of advanced integrated nano-composites, fundamental properties (Size effects on structure and morphology of free or supported nano particles, size and confinement effects), applications of nano materials.

Unit 2: Green Chemistry **25% (15 Hours)**

Need for Green Chemistry, Goals of green chemistry, Limitations/obstacles in pursuit of the goals of green chemistry, green chemistry in sustainable development. Twelve principles of green chemistry with their explanation and examples; designing a green synthesis using these principles, immobilized solvents and ionic liquids; energy requirements for reactions like use of microwaves, ultrasonic energy; green synthesis of adipic acid, catechol, ibuprofen, paracetamol, BHT. Microwave assisted reactions in water (Hofmann elimination, Hydrolysis of benzyl chloride, Benzamide), Ultrasound assisted reactions in water (Esterification, saponification, substation reactions, alkylation, oxidation, reduction)

Unit 3: Nuclear Chemistry-1 **25% (15 Hours)**

Introduction. Atomic structure, Isotopes, Isomers, Isobars, Isotones.

Nuclear reaction, Nuclear stability, Mass spectrograph, Thomson's parabola method, Aston's Dempster's, Bainbridge Neir's Nuclear reactions classifications, Q-values equation and calculations, Cross-sections and its determination, High energy reactions, Direct nuclear reactions, Photo nuclear reactions, Thermo nuclear reactions, Nuclear radio activity: α,β,ϒ rays, Decay schemes, Group displacement rules, Mechanism of radioactive decay, GEIGER-

NUTTALS RULE, Rate of nuclear disintegration, Radioactive equilibrium and its types, Cyclotron, Synchrotron, Linear accelerator.

Unit 4: Nuclear Chemistry-2 **25% (15 Hours)**

Methods of artificial disintegration, Nuclear fission and nuclear fusion, Atomic bomb, Hydrogen bomb, Nuclear Models: Shell Model (periodicity, properties, magic number nuclear configuration), liquid drop model and semi empirical equation, fermi gas model, collective model.

Synthesis of radio isotopes of Na and C

Application of Radio isotopes: Chemical investigations, age determination, Medicinal applications, analytical applications and industrial applications.

Books:

1. Klabunde K.J.(Ed.), "Nanoscale materials in chemistry ", John Wiley &sons Inc. 2001
2. Nalwa, H.S.(Ed.), "Encyclopedia of nanoscience and nanotechnology" 2004
3. Sergeev, G.B. Nano chemistry, Elsevier, B.V. 2010
4. Schmid, G. (Ed.) "Nanoparticles", Wiley-VCH Verlag GmbH & co. KgaA. 2004
5. Rao, C.N.R., Muller, A. and Cheentham, A.K(Eds), "Chemistry of nanomaterials" , Wiley-VCH, 2005 NSC
6. V.K. Ahluwalia & M.R. Kidwai: New trends in Green chemistry, Anamalaya publications (2005)
7. Advanced physical Chemistry By Gurdeep Raj.
8. Principle of Physical Chemistry by Puri Sharma Pathania
9. Nuclear Chemistry By C .V Shekar

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M.Sc. Semester -IV
Physical Chemistry (S.E)
CHN-705(A)-P
Paper-V

Unit: 1: **50% (15 Hours)**

(A) High performance (Pressure) liquid Chromatography

Introduction, Principle, Instrumentation, Apparatus and Materials, Column efficiency and selectivity, Comparison of High-performance liquid chromatography and Gas Liquid chromatography, Applications, HPLC adsorption Chromatography, HPLC partition chromatography

(B) Adsorption Chromatography

Introduction, Theory, Adsorbents, Solvents, Procedure, Differences between Adsorption and gas liquid chromatography, Limitations, Applications of Adsorption chromatography

Unit:2 **50% (15 Hours)**

(A) Column Chromatography

Introduction, Principle, Experimental details, Theory of development Column efficiency, Factors affecting column efficiency, Applications of Column chromatography

(B) Gel Chromatography or Gel Permeation Chromatography

Introduction, Principle, Materials, Gel preparation, Column packing and detectors, Applications, Advantage of Gel chromatography

(C) Ion Exchange Chromatography

Introduction, Definition, Principle, Cation exchangers, Anion exchangers, Regeneration, Ion exchange Column used in chromatographic separations, Selections of suitable systems, Ion exchange capacity, Ion exchange techniques, Application of ion exchangers

Book:

1. Instrumental Methods of Chemical Analysis by Gurdeep R Chatwal, Sham K Anand Himalaya Publishing House.

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M.Sc. Semester -IV
Physical Chemistry (S.E)
CHNN-705(B)
Paper-V

Unit:1 Infrared Absorption Spectroscopy 50% (15 Hours)

Introduction, The range of infrared radiation, Nomenclature of infrared spectra, Theory of Infrared Absorption spectroscopy or requirements for infrared radiation absorption, Mathematical theory of IR Absorption spectroscopy, Linear molecules, Symmetric top molecules, Asymmetric Molecules, Instrumentation, Single beam and double beam spectrophotometers, Modes of vibrations of atoms in polyatomic molecule, Factors which influence Vibrational Frequencies, Selection rules, Positions and intensity of bands, Intensity of Absorption bands, Units of measurements, Applications of infrared spectroscopy to organic compounds, Applications of infrared spectroscopy to inorganic complexes, Miscellaneous Examples, Attenuated total reflectance, Nondispersive infrared, Photothermal beam deflection spectroscopy (PBDS), Application of Infrared spectroscopy to quantitative analysis, Limitations of Infrared spectroscopy

Unit:2 50% (15 Hours)

(A) Raman spectroscopy

Introduction, Principle, Characteristic properties of Raman lines, Differences between Raman spectra and Infrared spectra, Mechanism of Raman effect, Instrumentation, Intensity of Raman peaks, Applications of Raman spectroscopy, Short type questions

(B) Visible Spectrophotometry and colorimetry

Introduction, Theory of Spectrophotometry and colorimetry, Deviations from Beer's law, Instrumentation, Obtaining and Interpreting data, Applications of colorimetry and spectrophotometry, Molar compositions of complexes, Spectrophotometric titrations

(C) Ultraviolet spectroscopy

Introduction, Origin and theory of ultraviolet spectra, Types of transitions of Inorganic molecules, Types of transitions of organic molecules, The shape of UV absorption curves, Transition probability

Books:

1. Principle of Physical Chemistry by Puri Sharma Pathania.
2. Advanced physical Chemistry By Gurdeep Raj.
3. Atomic and Molecular spectra by Raj Kumar.

M.Sc. Semester -IV

Physical Chemistry Practicals

CHNN-706-(P) & CHNN-707-(P)

Section-1 Minimum 04

1. Determine effect of Cl^-, Br^- or I^- ions on alkaline hydrolytic constant of n-butyl acetate conductometrically
2. Determination of mixture of acids and relative strength of weak acids in mixture conductometrycally
3. Determination of CMC and ΔG of sodium dodecyl sulphate conductometrically
4. Investigate effect of substitution of chloride ions on rate constant of inversion of cane sugar by using mono, di and trichloro acetic acid as catalyst (Polarimetry)
5. Study the adsorption of acetic acid or oxalic acid from aqueous solution by activated charcoal. Examine validity of Freundlich and Langmuir's adsorption isotherm
6. Verify law of refraction of mixtures (Glycerol and water) using Abbe's refractometer.
7. Determine the heat capacity of the colorimeter and concentration of unknown solution of benzoin acid by measuring heat changes during dilution.
8. Gas chromatographic analysis of tertiary mixture of Pantene, Hexane and Heptane
9. Estimation of insecticides in water using HPLC.
10. To determine the amount of riboflavin in given B-complex tablet by Fluorimetry.
11. To study the complexation of Ni^{+2} with EDTA by conduct metrically.
12. To determine the Amount of aspirin content in a given Tablet by conduct metrically.
13. To determine the dissociation constant (Ka) of weak organic acid [Benzoic Acid] by conduct metrically.

Section-2 Minimum 05

1. Determine mol. Wt. of polymer by viscosity measurement/turbidity measurement.
2. Investigate autocatalytic reaction between oxalic acid and potassium permanganate.
3. Separation by TLC.

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Phenyl butazene	Caffeine
Aspirin	Phenacetin
Phenazone	Paracetamol
Glycine	Glutamic Acid

4. Determination of ΔG, ΔH and ΔS of silver benzoate by solubility product method.
5. Determine partial molar volume by intercept using density measurement.
6. Study the variation solubility of calcium hydroxide in presence of sodium hydroxide and hence determine the solubility product of calcium hydroxide at room temperature.
7. Determine adiabatic compressibility and intermolecular free length for interaction between DMSO and acetone for binary mixtures.
8. Determine ultrasound velocity for addition of NH_4Cl solution in water and acetone binary mixture at room temperature.
9. Study the kinetics of oxidation of propanol using an oxidant.
10. To determine the capacity of anions/cation exchange resin by column method.
11. To determine the standard electrode potential of silver/ copper/ lead electrode.
12. Potentiometric titration of halide-mixture of KCl+KBr+KI against given std. $AgNO_3$ Solution
13. To determine rate constant and order of reaction between acetone and iodine catalysed by mineral acid.

Section-3 Minimum 05

1. Study effect of ionic strength on activity coefficient and mean activity coefficient of silver ion in 0.01M silver nitrate solution by potentiometer.
2. Determine solubility of Ag_2CrO_4 potentiometer.
3. Discuss the primary salt effect in a reaction between $K_2S_2O_8$ and KI.
4. To study the complex formation between Fe (III) and salicylic acid and find instability constant and free energy change by spectrophotometer.
5. Determine partial molar volume by intercept using density measurement.
6. To estimate the amount of D-glucose in given solution calorimetrically.
7. Determine the dissociation constant of indicator (Methyl red/O-nitrophenol/Phenolphthalein) by spectrophotometer.
8. Simultaneous spectrophotometric determination of Cr^{+6}, Mn^{+7}.
9. Ultraviolet spectrophotometric determination of Aspirin, Phenacetin & in APC table using solvent extraction.

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10. Determine the heat of solution of a solid compound ($CaCl_2$, $MgCl_2$ or synthesized/ Schiff's base)and also lattice energy of $CaCl_2$ using Bron-Haber cycle.
11. To study the effect of electrolytes on water structure by viscosity method.
12. To determine the molar refraction and refractive index of a given salt.
13. To study the variation of refractive index with composition of mixture of carbon tetra chloride and ethyl acetate.
14. To determine parachor/density/ refractive index of binary solutions.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

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FACULTY OF SCIENCE

M.Sc. BOTANY

Semesters: I

SYLLABUS

PROGRAM : HNGU 2059

Curriculum as per UGC Guideline

With Semester/CBCS/Grading Pattern

With effect from June - 2021 (and thereafter)

Submitted on
Date: 07/04/2021

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TOTAL PAGE: 25

Proposed Details of Course pattern and scheme of examination

Sem.	Course	Interaction (hrs/week)	Duration of Exam(hrs)	Marks			Credit
				Internal	External	Total	
Sem.-I	Core Paper-I	4	2.30	30	70	100	4
	Core Paper-II	4	2.30	30	70	100	4
	Core Paper-III	4	2.30	30	70	100	4
	Core paper-IV	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-I	2	2.00	15	35	50	2
	Practical (Based on core paper-I & II, III & IV)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-II	Core Paper-V	4	2.30	30	70	100	4
	Core paper-VI	4	2.30	30	70	100	4
	Core paper-VII	4	2.30	30	70	100	4
	Core Paper-VIII	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-II	2	2.00	15	35	50	2
	Practical (Based on core paper-V&VI,VII&VIII)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-III	Core Paper-IX	4	2.30	30	70	100	4
	Core paper-X	4	2.30	30	70	100	4
	Core paper-XI	4	2.30	30	70	100	4
	Core paper-XII	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-III	2	2.00	15	35	50	2
	Practical (Based on core paper-IX & X, XI & XII)	6	10(5X2days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-IV	Core Paper-XIII	4	2.30	30	70	100	4
	Core Paper-XIV	4	2.30	30	70	100	4
	Core Paper-XV	4	2.30	30	70	100	4
	Core Paper-XVI	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-IV	2	2.00	15	35	50	2
	Practical (Based on core paper-)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
OR							
Sem-IV	Core Paper-XIII	4	2.30	30	70	100	4
	Core Paper-XIV	4	2.30	30	70	100	4
	Core Paper-XV	4	2.30	30	70	100	4
	Minor Dissertation	12	10 (5X2 days)	-	300	300	12
	Total	**24**		**90**	**510**	**600**	**24**
OR							
Sem-IV	Major Dissertation	24	15 (5X3 days)	--	600	600	24
	Total	**24**			**600**	**600**	**24**

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Programme: M. Sc. BOTANY (CBCS)
Syllabus with effective from: June–2021

M. Sc. Botany				
Semester	**I**	**II**	**III**	**IV**
Core Paper-I (4Credits)	**Biology and Diversity-I** (Virus, Bacteria, Algae and Fungi) And Plant Pathology **(BOC-101)**	**Biology and Diversity-II** (Bryophytes, and Pteridophytes) **(BOC-201)**	**Biology and Diversity-III** (Gymnosperms and Fossils) **(BOC-301)**	**Plant Biotechnology (BOC-401)**
Core Paper-II (4Credits)	**Plant Taxonomy (BOC-102)**	**Plant Development and Reproduction (BOC-202)**	**Molecular Biology of Plants (BOC- 302)**	**Ethnobotany, Mushrooms and Mycorrhiza (BOC-402)**
Core Paper-III (4Credits)	**Cell Biology (BOC-103)**	**Biochemistry, Biophysics and Instrumentation (BOC-203)**	**Plant Ecology (BOC-303)**	**Plant Resources Utilization and Conservation (BOC-403)**
Core Paper-IV (4Credits)	**Genetics & Evolution (BOC-104)**	**Research methodology, Biostatistics, IPR and Biosafety (BOC-204)**	**Plant Physiology (BOC-304)**	**Horticulture and Plant Breeding (BOC-404)**
Elective-I (2 Credits) (Any One)	**Biofertilizer Technology (BOE-101)**	**Plant Tissue Culture (BOE-201)**	**Air Pollution and Climate Change (BOE-301)**	**Bioinstrumentation (BOE-401)**
	Environmental Biology (BOE-102)	**River Ecology and Water Management (BOE-202)**	**Herbal Medicine (BOE-302)**	**Conservation and Restoration Ecology (BOE-402)**
	Biodiversity (BOE-103)	**Bioinformatics (BOE-203)**	**Biostatistics (BOE-303)**	**Photobiology, Molecular Microbiology and Synthetic Biology (BOE-403)**
Core Practical - I (2 Credits)	**BOP-101 On the basis of BOC-101 & 102**	**BOP-201 On the basis of BOC-201&202**	**BOP-301 On the basis of BOC-301 & 302**	**BOP-401 On the basis of BOC-401 & 402**
Core Practical-II (2 Credits)	**BOP-102 On the basis of BOC-103 & 104**	**BOP-202 On the basis of BOC-203 & 204**	**BOP-302 On the basis of BOC- 303 & 304**	**BOP-402 On the basis of BOC-403 & 404**
				OR
				BOC-401, 402, 403 & Minor Dissertation
				OR
				Major Dissertation

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Detailed Course Pattern for Each Semester

M. Sc. Part-1: Semester - I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-1	Core-I	2:30	70	30	100	4	4
Paper-2	Core-II	2:30	70	30	100	4	4
Paper-3	Core-III	2:30	70	30	100	4	4
Paper-4	Core-IV	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core-I & II)	Pract. -I	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core-III & IV)	Pract -II	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

M. Sc. Part-1: Semester – II

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-5	Core-V	2:30	70	30	100	4	4
Paper-6	Core-VI	2:30	70	30	100	4	4
Paper-7	Core-VII	2:30	70	30	100	4	4
Paper-8	Core-VIII	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core-V & VI)	Pract-III	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core-VII & VIII)	Pract-IV	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

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M. Sc. Part-2: Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-9	Core-IX	2:30	70	30	100	4	4
Paper-10	Core-X	2:30	70	30	100	4	4
Paper-11	Core-XI	2:30	70	30	100	4	4
Paper-12	Core-XII	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core - IX & X)	Pract-V	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core - XI & XII)	Pract-VI	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

M. Sc. Part-2: Semester -IV

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-13	Core-XIII	2:30	70	30	100	4	4
Paper-14	Core-XIV	2:30	70	30	100	4	4
Paper-15	Core-XV	2:30	70	30	100	4	4
Paper-16	Core-XVI	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core - XIII & XIV)	Pract-VII	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core - XV & XVI)	Pract-VIII	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

OR

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-13	Core-XIII	2:30	70	30	100	4	4
Paper-14	Core-XIV	2:30	70	30	100	4	4
Paper-15	Core-XV	2:30	70	30	100	4	4
Minor Dissertation	---	10 (5 X 2 Days)	300	---	300	12	12
Total	---		**510**	**90**	**600**	**24**	**24**

OR

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Major Dissertation	---	15 (5 X 3 Days)	600	---	600	24	24
Total	---	---	**600**	---	**600**	**24**	**24**

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General format / design of core course
Question paper style / Pattern for Semester end examination

The semester- end examination question paper shall have following format:

Question paper will be set in the view of the / in accordance with the entire Syllabus and preferably covering each unit of the Syllabi.

Question-1(From Unit - 1)	**18 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following - Short Notes / Differences / Comparison (One out of two)	07 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

Question – 2 (From Unit - 2)	**17 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following Short Notes / Differences / Comparison (One out of two)	06 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

Question – 3 (From Unit - 3)	**18 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following - Short Notes / Differences / Comparison (One out of two)	07 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

Question – 4 (From Unit - 4)	**17 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following Short Notes / Differences / Comparison (One out of two)	06 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

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General format / design of Elective course
Question paper style / Pattern for Semester end examination

The semester – end examination question paper shall have following format

Question paper will be set in the view of the / in accordance with the entire Syllabus and preferably covering each unit of the Syllabi

Question- 1 (From Unit - 1)	**14 marks**
(A) Answer the following –Long answer question (One out of two)	08 marks
(B) Answer the following – Medium answer question (One out of two)	06 marks
Question – 2 (From Unit - 2)	**14 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following – Medium answer question (One out of two)	06 marks
Question – 3 (From Unit -1 & 2)	**07 marks**

Answer the following – Very short answer question (Seven out of ten)

(Unit wise five questions)

In One word, Fill in the gap, Objective type questions.

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M. Sc. BOTANY SEMESTER - 1

CORE PAPERS

BOC-101 Biology and Diversity – I (Virus, Bacteria, Algae and Fungi) and Plant Pathology
BOC-102 Plant Taxonomy
BOC-103 Cell Biology
BOC-104 Genetics and Evolution

PRACTICAL PAPERS

BOP-101 Practical Based on Topics Covered in BOC – 101 & BOC - 102
BOP-102 Practical Based on Topics Covered in BOC – 103 & BOC - 104

ELECTIVE PAPERS

Choice-based: Student should select any one course from the following
BOE-101 Bio-fertilizer Technology
BOE-102 Environmental Biology
BOE-103 Biodiversity

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BOC-101

Biology and Diversity - I

(Virus, Bacteria, Algae, Fungi) and Plant Pathology

(Credit-4)

Unit-I: Virus and Bacteria

- Virus: General Characters and Types of Virus (On the basis of Genome), Ultra structure of Virons (Symmetry: Helical and Complex).
- Economic Importance of Virus.
- Bacteria: General Characters and classification of Bacteria (Based on Flagella), Nutrition and Reproduction in Bacteria, Ultra structure of Bacteria.
- Cyanobacteria: Salient features.
- Economic Importance of Bacteria.

Unit - II: Phycology (Algae)

- Algae: General Characters and Classification of Algae by Smith.
- Thallus organization in Algae.
- Reproduction in Algae.
- Salient features of Chlorophyta, Charophyta, Phaeophyta and Rhodophyta.
- Economic Importance of Algae: Algal blooms, Algal biofertilizer, Algae in Industry.

Unit-III: Mycology (Fungi)

- General Characters and Classification of Fungi by Ainsworth.
- Cellular Organization (Unicellular and Multicellular), Nutrition in fungi.
- Reproduction in Fungi, Heterothallism.
- General account of Zygomycotina, Ascomycotina, Basidomycotina and Deutromycotina.
- Economic Importance of Fungi: In Industry, Medicine and bio-control agent.

Unit-IV: Plant Pathology

- Plant Pathology: Classification of plant diseases (on the basis of host and origin), General Symptoms of plant diseases.
- Dissemination of plant diseases (Direct and Indirect). Defense mechanism (Morphological and Bio-Chemical).
- Plant pathogens: Symptoms, Diseases cycle, Control measures: Bacterial (Bacterial blight of paddy) and Fungal (Late blight of Potato, Tikka disease in Groundnut & Powdery mildew of Cucurbits).

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Suggested Readings:

- Sharma, P. D. (2011) Microbiology. Rastogi Publication. Meerut.
- Pelczar M. J, Chan E. C. Sand Krieg N. R. (2004) Microbiology, Tata McGraw – Hall Publishing Company Ltd. NewDelhi.
- Hait G; Bhattacharya K and Ghosh A. K. (2008) A Taxt Book of Botany,Vol-I, New Central Book Agency (P) Ltd. Kolkata.
- SinghV; Pande P. Cand Jain D. K. (2008-09) A Taxt Book of Botany, rastogi Publication, Meerut.
- Barsanti L, Gualtieri P (2006) Algae: Anatomy, Biochemistry and Biotechnology, CRC Press, Taylor and Francis, Boca Raton.
- Bold H C, Wynne M J (1985) Introduction to the Algae, 2nd edition, Prentice-HallInc, New Jersey.
- Kumar H D (1999) Introductory Phycology, 2nd edition, Affiliated East-West Press Pvt. Ltd., New Delhi
- Fritsch F E (1935) The Structure and Reproduction of the Algae, Vol I, Cambridge University Press, Cambridge.
- Fritsch F E (1945) The Structure and Reproduction of the Algae, Vol II, Cambridge University Press, Cambridge.
- Lee R E (2008) Phycology, 4th edition, Cambridge University Press, Cambridge.
- South G R, Whittick A (1998) Introduction to Phycology, Blackwell Scientific Publication, London.
- Webster John (1980) Introduction to fungi, Cambridge University Press, Cambridge.
- Alexopoulos C J, Minus C W , Blackwell M (1996) Introductory Mycology, John Wiley and Sons, Inc, NewYork.
- Carlile M J, Watkinson S C, Booday G W (2001) The Fungi, Academic Press, Cambidge.
- Maheshwari R (2012) Fungi: Experimental Methods in Biology, CRC Press, Boca Raton, Florida.
- Deacon J W, Blackwell M (1997) Introduction to Modern Mycology, Oxford.
- Webster J, Roland W S (2007) Introduction to Fungi, Cambridge University Press, Cambridge Rangaswamy, G and Mahadevan, A (1999) Diseases of crop plants in India (4th edn) Prentice Hall of Indian Pvt. New Delhi.
- Pandey B. P. (2006) Plant Pathology-Pathogen and Plant Diseases. S. Chand & Co. Ltd. New Delhi.
- Mehrotra R. S. (1991) Plant Pathology, Tata McGraw-Hill Publishing Co. Pvt. Ltd. New Delhi. Agrios George N. (2004) Plant Pathology, Academic Press, Reed Elsevier India Pvt. Ltd. New Delhi.
- Sharma P. D. (2003) Microbiology and Plant Pathology, Rastogi Publications, Meerut.

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Laboratory Work Based on Topics Covered in BOC-101

Virus and Bacteria:

- Ultrastructure of Virions (through chart).
- Simple Staining – Mono-chrome staining.
- Special Staining – Gram staining.
- Study of following Cyanobacteria: *Nostoc*, *Oscillatoria*

Algae:

- Study of following Algae:
- *Chlorella, Ulva, Spirogyra, Chara, Padina, Sargassum, Polysiphonia*.

Fungi:

- Study of following Fungi :
- *Mucor, Sclerospora, Peziza, Aspergillus, Agaricus, Polyporus, Colletotrichum*.

Plant Pathology:

- Study of following Plant diseases:
- Bacterial blight of Paddy
- Late Blight of Potato
- Tikka disease in Groundnut
- Powdery mildew of Cucurbits

BOC-102
Plant Taxonomy
(Credit-4)

Unit-I:

- Principles of taxonomy, Aims of taxonomy, Taxonomic hierarchy.
- Major categories: Families and other categories; Minor categories: Genus and Species.
- Origin and evolution of Angiosperms.
- Herbarium methodology, Important world Herbaria and Botanical gardens, Importance of Herbaria and Botanical gardens.

Unit-II:

- History of plant nomenclature.
- ICBN–Principles, Ranks, Typification, The principle of priority, Retention, Choice of rejection of names & epithet.
- Classification and relative merits and demerits of major systems of classification Bentham & Hooker, Takhtajan, Bassey, APG (IV).

Unit-III:

- The Taxonomic importance characters derived form the following disciplines: Morphology, anatomy, embryology, cytology.
- Taxonomic tools: Flora and Monographs, Serology, computers and GIS.
- Flora of Gujarat state: General account and Endemic plants of Gujarat.
- Concepts of phytogeography: Endemism, Hot spots of India.

Unit-IV:

- Taxonomical study of the following families with reference to their geographical distribution, systematic position, floral variation and economic importance:
- Study of **DICOTYLEDONS** families:
    - **Polypetalae**: Menispermaceae, Capparaceae, Rutaceae, Meliaceae, and Apiaceae.
    - **Gamopetalae**: Oleaceae, Salvadoraceae, Asclepiadaceae, Boraginaceae, Lamiaceae.
    - **Apetalae**: Amaranthaceae, Euphorbiaceae, Casuarinaceae.
- Study of **MONOCOTYLEDONS** families:
    - Liliaceae, Poaceae.

Suggested Readings:

- Cole, A. J. (1969) Numerical Taxonomy,Academic Press, London.
- Davis, P. H. and Heywood, V. H. (1973) Principles of Angiosperms Taxonomy. Robert Kreiger Pub. Co., New York.
- Grant, V. 1971. Plant Speciation. Columbia University Press, New York.
- Grant, W. F. (1984).Plant Biosystematics. Academic Press, London.
- Harrison, H. J. (1971). New Concepts in Flowering Plant Taxonomy. Hieman Educational Books Ltd., London.
- Heslop-Harrison, J. 1967. Plant Taxonomy. English Language Book Soc. & Edward Arnold Pub. Ltd., UK.
- Heywood, V. H. and Moore, D. M. (1984). Current Concepts in Plant Taxonomy. Academic Press, London.
- Jones, A. D. and Wilbins, A. D. (1971). Variations and Adaptations in Plant Species. Hieman & Co. Educational Books Ltd., London.
- Jones, S. B., Jr. and Luchsinger, A. E. (1986). Plant Systematics . McGraw-Hill Book Co., New York.
- Nordenstam, B., El Gazaly, G. and Kassas, M. (2000). Plant Systematics for 2K Century. Portland Press Ltd., London.
- Radford, A. E. (1986). Fundamentals of Plant Systematics. Harper & Row Publications, USA.
- Singh, H. (1978). Embryology of Gymnosperms. Encyclopaedia of Plant Anatomy X. Gebruder Bortraeger,Berlin.
- Solbrig, O. T. (1970). Principles and Methods of Plant Biosystematics. The Mac Millan Co.- Collier-MacMillan Ltd., London.
- Solbrig, O. T. and Solbrig, D. J. (1979). Population Biology and Evolution. Addison-Wesley Publication Co. Inc., USA.
- Stebbins, G. L. (1974). Flowering Plant- Evolution Above Species Level. Edward Arnold Ltd., London
- Stace, C. A. (1989). Plant Taxonomy and Biosystematics (2nd edition). Edward Arnold Ltd., London.
- Takhtajan, A. L. (1997). Diversity and Classification of Flowering Plants. ColumbiaUniversityPress, NewYork. Woodland, D. W. 1991. Contemporary Plant Systematics. Prentice Hall, NewJersey.

Laboratory Work Based on Topics Covered in BOC-102

- Methods of identification of plants and preparation of at least 15 digital herbarium sheets.
- Study of genera from listed Families as per Theory Syllabus.
- Identify the genus and species of given plant specimens with the help of standard Flora.
- To prepare Dichotomous key with the help of given specimens.

BOC-103 Cell Biology
(Credit-4)

Unit-I:

- Cell wall: Structure and functions; Plasmodesmata: Structure; role in movement of molecules and macromolecules.
- Plasma membrane: Structure, models, and functions; sites for ATPases, ion carriers, channels and pumps; receptors.
- Chloroplast and Mitochondria: Ultra Structure and Functions.
- Other cellular organelles: Structure and functions of microbodies, Golgi apparatus, Lysosomes, endoplasmic reticulum, Ribosomes.

Unit-II:

- Cytoskeleton; organization and role of microtubules and flagella.
- Cell cycle: Control mechanisms; role of cyclins and cyclin-dependent kinases; cytokinesis and cell plate formation.
- Cell Division: Amitosis, Mitosis and Meiosis.
- Apoptosis/ Programmed Cell Death with reference to plant cells.

Unit-III:

- Nucleus: Structure; nuclear pores; nucleosome organization, Nucleolus.
- Chromatin organization: Chromosome structure and packaging of DNA, molecular organization of centromere and telomere.
- Euchromatin and Hetero chromatin, Karyotype analysis.
- Specialized type of chromosomes: Structure and functions of polytene, lamp brush and Sex chromosomes.

Unit-IV:

- Experimental approaches for studying Cells, Cell Fixation and Staining.
- Microscopy: Various types of light Microscopy & Electron Microscopy, Phase-Contrast Microscopy and Fluorescent microscopy.
- Cytochemical methods and cell fractionation (Flow Cytometry).
- Techniques in cell biology: Immuno techniques; in situ hybridization to locate transcripts in cell types; FISH, GISH.

Suggested Readings:

- Lewin, B. (2000). Genes VII. Oxford University Press, New York.
- Rost, T. *et al*. (1998). Plant Biology. Wadsworth Publishing Co., California, USA.
- Krishnamurthy, K. V. (2000). Methods in Cell Wall Cyto chemistry. CRC Press, Boca Raton, Florida.
- De, D. N. (2000). Plant Cell Vacuoles: An Introduction. CSIRO Publication, Collingwood, Australia.
- Fukui, K. and Nakayama, S. (1996). Plant Chromosomes: Laboratory Methods. CRC Press, BocaRaton, Florida.
- Sharma, A. K. and Sharma, A. (1999). Plant Chromosomes: Analysis, Manipulation and Engineering. Harwood Academic Publishers, Australia.
- Buchanan B B, Gruisemm W, Jones R L (2015). Biochemistry and Molecular Biology of Plants, 2nd edition, Wiley Blackwell, New Jersey.
- Hopkins W G, Huner NPA (2009) Introduction to Plant Physiology, 4th edition Wiley International edition, John Wiley & Sons, New York.
- Taiz L, Zeiger E, Moller I M, Murph A (2015) Plant Physiology and Development, 6th edition, Sinurer Associates Inc Publishers, Sunderland, Massachusetts.
- Frank B. Salisbury and Cleon W. Ross (1985). Plant Physiology Wadsworth Publishing Company, Belmont, California.
- Robert M. Devlin (3rd edition) (1975) Plant Physiology Van Nostr and Reinhold Company, New York.
- Walter Larcher (4th edition) (2003) Physiological Plant Ecology: Ecophysiology and Stress Physiology of Functional Groups Springer Verlag, Berlin.
- Hans Mohr and Peter Schopfer (2010) Plant Physiology Springer Verlag, Berlin. Edwin Oxlade (2007) Plant Physiology: The Structure of Plants Explained Glmp Ltd, Abergele, United Kingdom.

Laboratory Work Based on Topics Covered in BOC-103

- Laboratory Exercises:
  - Isolation of Chloroplast by centrifugation.
  - Isolation of mitochondria by ultracentrifugation.
  - Temporary stained preparation of Mitosis / Meiosis – Onion tip, *Ipomoea* bud, *Tradescantia* bud, *Aloe* bud.
  - Study of Giant chromosomes from Salivary glands of *Chyronomous* larva (Polytene)/Chart.
  - Salivary glands of Drosophila (Lampbrush) - Chart.
  - Study of various cell organelles (as per syllabus) through permanent slide/charts/models.
  - Study of Karyotype in plant cells.
  - Demonstration of SEM and TEM - photograph.

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BOC-104 Genetics and Evolution
(Credit-4)

Unit-I : Genetics - I

- Gene structure: Gene vs allele, fine structure of gene as cistron, recon and muton.
- Genetic code: Deciphering genetic code, properties of genetic code, initiation and termination codons, mutation and genetic code, wobble hypothesis, new genetic codes, overlapping and split genes.
- Extra chromosomal inheritance(maternal inheritance):
    - Chloroplast genome (cp-DNA); Plastid inheritance in ***Mirabilis jalapa***.
    - Mitrochondrial genome (mt-DNA); Mitochondrial inheritance in ***Zea mays*** (Male sterility-Types, origin, induction and application).
- Petite in **yeast** and Porky in ***Neurospora.*** Comparison between Cp-DNA and Mt-DNA

Unit- II : Genetics - II

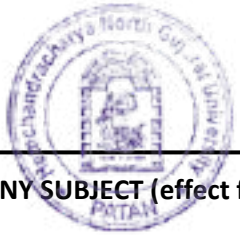
- Mutation: Spontaneous and induced mutation, Physical and chemical mutagens; Molecular basis of gene mutations.
- Transposable elements: IS elements, Transposons in Prokaryotes and Eukaryotes, Ac-Ds system, Retroelements(Viral and Non-viral).
- DNA damage and repair mechanisms; inherited human diseases and defects in DNA repair.
- Initiation of cancer at cellular level; Oncogenesis, Oncogene, proto-oncogenes and onco viruse.

Unit – III: Genetics - III

- Mendalian (mono & Di-hybridization) and Non-mendelian genetics (9:6:1), Epistatis (9:3:4 & 12:3:1), Polygenic inheritance (characteristics and Kernel colour in Wheat) and multiple allele.
- Chromosome theory and sex determination, chromosomal aberration.
- Linkage and crossing over: Complete and incomplete linkage, Types of Crossing over, a three point test cross and Chi square(X^2) test for segregation.
- Linkage maps in Drosophila and chromosomal mapping.

Unit – IV: Evolution

- Emergence of evolutionary thoughts: Lamarckism; Darwinism – concepts of variation, adaptation, struggle for existence, survival of fittest and natural selection.
- Origin of cells and unicellular evolution: Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers; Concept of Oparin and Haldane; Experiment of Miller (1953); The First cell.
- Origin of prokaryotes; Origin of eukaryotic cells; Evolution of unicellular eukaryotes; Anaerobic metabolism, photosynthesis and aerobic metabolism.
- Evolutionary divergence : Plant diversity as a result of evolution.



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Suggested Readings :

- Atherly, A.G., Girton, J.R. and McDonald, J.F. (1999). The Science of Genetics. Saunders College Publishing, Fort Worth, USA.
- Burnham, C.R. (1962). Discussions in Cytogenetics. Burgess Publishing Co., Minnesota.
- Busch, H. and Rothblum, L. (1982). Volume X. The Cell Nucleus rDNA Part A. Academic Press.
- Hartl, D.L. and Jones, E.W. (1998). Genetics: Principles and Analysis (4h edition). Jones & Bartlett Publishers, Massachusetts, USA.
- Khush, G.S. (1973). Cytogenetics of Aneuploids. Academic Press, New York, London.
- Karp, G. (1999). Cells and Molecular Biology: Concepts and Experiments. John Wiley & Sons, Inc., U.S.A.
- Lewin, B. (2000). Gene VII. Oxford University Press, New York, USA.
- Lewis, R. (1997). Human Genetics: Concepts and Applications edition). WCB McGraw Hill, USA.
- Russel, P. J. (1998). Genetics (5th edition). The Benjamin/Cummings Publishing Company Inc., USA.
- Snustad, D.P. and Simmons, M.J. (2000). Principles of Genetics (2nd edition). John Wiley & Sons Inc., USA.

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Laboratory Work Based on Topics Covered in BOC-104

Suggested Laboratory Exercises

- Induction of polyploidy using Colchicine.
- Study of permanent slides/ charts/ models/ photographs as per theory syllabus.
- Solve the genetic problems based on topics covered in the theory syllabus.

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M.Sc. Botany Semester- I

Botany Practical Examination, Nov/Dec 20___

BOP 101

(Based on Topics Covered in BOC-101 & BOC-102)

(Virus and Bacteria, Algae, Fungi, Plant Pathology and Plant Taxonomy)

Date: / /20 Place:

Time: 5 Hours Maximum Marks: 75

Instruction: Students are requested to follow instructions given by the examiners

Q.1: **(A)** Identify and Classify giving with suitable reasons of given Specimen "**A"** **06**

(B) Stain the given material "**B"** .Write the principle and show yours slide to the Examiner. **06**

Q.2: **(C)** Expose the reproductive organ from the given specimen **"C".** Prepare the Slide and draw neat and labeled diagram. Show your slide to the examiner. **05**

(D) Expose and mount the given material **"D"** of plant pathogen. Prepare the slide and draw neat and labeled diagram. Show to the examiner. **05**

Q.3: Refer to the given specimens "**E", "F"** and **"G"** to the respective families Giving reasons including floral formula and floral diagram. **21**

Q.4: Identify the genus and species of given plant specimen "**H"** with the help of standard Flora. **08**

Q.5: Spot –"I", "J" and "K" **09**

Q.6: **(A)** Journal **03**

(B) Submission/Botanical Tour Report **05**

(C) Viva-voce **07**

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M.Sc. Botany Semester-I

Botany Practical Examination, Nov/Dec 20

BOP-102

(Based on Topics Covered in BOC-103 & BOC-104)

(Cell Biology, Genetics, Evolution and Plant Breeding)

Date: / /20 **Place:**

Time: 5 Hours **Maximum Marks: 75**

Instruction: Students are requested to follow instructions given by the examiners

Q.1: Make a temporary stained preparation of Mitosis/ Meiosis from given material 'A' and show any stage(s) of cell division to the examiner. **12**

Q.2: Make a temporary stained preparation of Giant chromosomes/ Polyploidy from given material '**B**' and show your preparation to the examiner. **10**

Q.3: Isolate Chloroplast/ Prepare Karyotype from the given material '**C**' and show your preparation to the examiner. **10**

Q.4: Solve and conclude the problems from genetics. **12**

D. _____

E. _____

Q.5: Comment upon the given spots/ Photographs/ Diagrams/ Models/ Charts. **16**

F. _____

G. _____

H. _____

I. _____

Q.6: **(A)** Journal **03**

(B) Submission/Botanical Tour Report **05**

(C) Viva-voce **07**

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BOE-101
BIOFERTILIZER TECHNOLOGY
(Credit-2)

UNIT-I

- Biofertilizers: Definition, types and applications in agriculture.
- Characteristics of biofertilizers: Rhizobium, Azotobactor, Azospirillum, phosphate-solubilizing microorganisms (PSMs), cyanobacteria, *Azolla*, mycorrhizae.
- Biological nitrogen fixation: Nitrogenase, substrates for nitrogenase, mechanism of action of nitrogenase, strategies to exclude oxygen and need to control hydrogen evolution, regulation of nitrogen fixation.

UNIT-II

- Rhizobium- legume symbiosis.
- Production technology: Strain selection, sterilization, growth and fermentation, mass production of various biofertilizers.
- Application technology: Standards and quality control, application for field and tree crops, nursery plants and seedlings, agronomical significance.

Suggested readings:

- Gallon J R, Chaplin A E (1987) An Introduction to Nitrogen Fixation, Cassel Educational Limited, London.
- Smith R J, Lea P J, Chaplin J R (1999) Nitrogen Fixation. In: Plant Biochemistry &Molecular Biology, 2nd edition, eds : Lea P J, Lee good R C, John Wiley & Sons, New York, pp. 137-162.
- Rai A N (1990) A Handbook of Symbiotic Cyanobacteria, CRC Press, BocaRaton, USA.
- Postgate J R (1987) Nitrogen Fixation, 2nd edition, Arnold, London.
- Stacey G, Burris R H , Evans H J (1992) Biological Nitrogen Fixation, Chapman & Hall, NewYork.
- Sprent J I, Sprent P (1990) Nitrogen Fixing Organisms: Pure and Applied Aspects. Chapman&Hall, London.
- Kannaiyan S, Kumar K, Govindrajan K (2007) Biofertlizers Technology, Saujanya Books, NewDelhi.

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BOE-102
ENVIRONMENTAL BIOLOGY
(Credit-2)

UNIT- I

- Introduction, Objectives and subdivisions; Factors-Wind and Fire
- Population Introduction, Influences (Growth and Density), Natality (Birthrate), Mortality (Death rate), Fluctuations, Dispersal.
- Community: Synecology and Autecology- Phyto-sociological characters and methods of plant community.
- Genecology-Concept of species, Ecotype, Niche.
- Ecosystem- Types, structure and function, Energy flow, productivity, Biogeochemical cycles (Nitrogen and Phosphorus)

UNIT- 2

- Plant Indicators
- Pollution-Toxic, Acid rain, Greenhouse gases, Ozone layer as an Earth protected umbrella.
- Phytogeography- Flora of India, Major biomes of the world.
- Conservation-Introduction, (IUCN categories), Forest research work in India, Wildlife sanctuaries in India.
- Environmental Education- Introduction, Goals, Objectives and Guiding principles.

Suggested Readings:

- Odum E P, Barret G W (2005) Fundamentals of Ecology, Thomson Ed. Brooks / Cole, Cengage Learning India Pvt Ltd, New Delhi.
- Singh J S, Singh S P, Gupta S R (2014) Ecology, Environmental Science and Conservation, S Chand & Co, New Delhi.
- Pungnaire F I, Valladares F (2007) 2nd Edition, Functional Plant Ecology CRC Press / Taylor &Francis Group, Boca Raton, Florida

BOE-103
BIODIVERSITY
(Credit-2)

Unit-I: Biodiversity– Types, Uses and its depletion

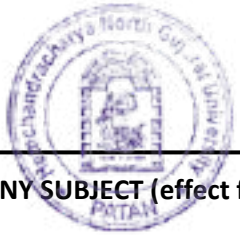
- Biodiversity Science: Definition, Significance of Biodiversity, types of Biodiversity (Genetic diversity, Species diversity and Ecosystem diversity).
- Ethics and Uses of Biodiversity: Biodiversity values, Ethical and Aesthetic values, Uses of plants (Food, Fodder and forage, Rattans and Canes, Medicinal and Ornamental Plants).
- Depletion of Biodiversity: Law of Genetic diversity, Species diversity and Ecosystem diversity, Factors affecting in loss of Biodiversity and process of species extinction, Loss in diversity of Major Ecosystem of the world.

Unit-II: Biodiversity- Conservation and Management

- Conservation of Biodiversity: Why Conservation; Conservation of Genetic diversity, Species diversity and Ecosystem diversity; In-situ and Ex-situ conservation; Role of Biotechnology in Biodiversity conservation; Current Practice in conservation of it in India; Social approaches in conservation of Biodiversity (examples like Chipko movement etc.); Role of Educational Institute in Biodiversity Conservation (BSI, NBPGR, ICAR).
- Biodiversity Management and Prospecting: Organizations associated with Biodiversity Management (IUCN, UNEP, UNESCO, WWF, ICSU, FAO, WCMC, GEF, ETC);
- Biodiversity legislation and conservation; Biodiversity Laws; Biodiversity- Information and Communication; Role of Indigenous Knowledge System in Biodiversity Prospecting and conservation; Intellectual Property Rights (IPRs); and Biopiracy.

Suggested readings:

- Heywood V H, Watson R T (1996) Global Biodiversity Assessment, Cambridge University Press, London.
- Bryant P J (2009) Biodiversity and Conservation, University of California, Irvine, USA.
- Singh J S, Singh S P, Gupta S R (2014) Ecology, Environmental Science and Conservation, S Chand & Co, New Delhi.



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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN - 384 265

FACULTY OF SCIENCE

M.Sc. BOTANY

Semesters: II

SYLLABUS

PROGRAM : HNGU 2059

Curriculum as per UGC Guideline

With Semester/CBCS/Grading Pattern

With effect from June - 2021 (and thereafter)

Submitted on
Date: 07/04/2021

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TOTAL PAGE: 25

Proposed Details of Course pattern and scheme of examination

Sem.	Course	Interaction (hrs/week)	Duration of Exam(hrs)	Marks			Credit
				Internal	External	Total	
Sem.-I	Core Paper-I	4	2.30	30	70	100	4
	Core Paper-II	4	2.30	30	70	100	4
	Core Paper-III	4	2.30	30	70	100	4
	Core paper-IV	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-I	2	2.00	15	35	50	2
	Practical (Based on core paper-I & II, III & IV)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-II	Core Paper-V	4	2.30	30	70	100	4
	Core paper-VI	4	2.30	30	70	100	4
	Core paper-VII	4	2.30	30	70	100	4
	Core Paper-VIII	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-II	2	2.00	15	35	50	2
	Practical (Based on core paper-V&VI,VII&VIII)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-III	Core Paper-IX	4	2.30	30	70	100	4
	Core paper-X	4	2.30	30	70	100	4
	Core paper-XI	4	2.30	30	70	100	4
	Core paper-XII	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-III	2	2.00	15	35	50	2
	Practical (Based on core paper-IX & X, XI & XII)	6	10(5X2days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-IV	Core Paper-XIII	4	2.30	30	70	100	4
	Core Paper-XIV	4	2.30	30	70	100	4
	Core Paper-XV	4	2.30	30	70	100	4
	Core Paper-XVI	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-IV	2	2.00	15	35	50	2
	Practical (Based on core paper-)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
OR							
Sem-IV	Core Paper-XIII	4	2.30	30	70	100	4
	Core Paper-XIV	4	2.30	30	70	100	4
	Core Paper-XV	4	2.30	30	70	100	4
	Minor Dissertation	12	10 (5X2 days)	-	300	300	12
	Total	**24**		**90**	**510**	**600**	**24**
OR							
Sem-IV	Major Dissertation	24	15 (5X3 days)	--	600	600	24
	Total	**24**			**600**	**600**	**24**

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Programme: M. Sc. BOTANY (CBCS)
Syllabus with effective from: June–2021

M. Sc. Botany				
Semester	**I**	**II**	**III**	**IV**
Core Paper-I (4Credits)	**Biology and Diversity-I** (Virus, Bacteria, Algae and Fungi) And Plant Pathology **(BOC-101)**	**Biology and Diversity-II** (Bryophytes, and Pteridophytes) **(BOC-201)**	**Biology and Diversity-III** (Gymnosperms and Fossils) **(BOC-301)**	**Plant Biotechnology (BOC-401)**
Core Paper-II (4Credits)	**Plant Taxonomy (BOC-102)**	**Plant Development and Reproduction (BOC-202)**	**Molecular Biology of Plants (BOC- 302)**	**Ethnobotany, Mushrooms and Mycorrhiza (BOC-402)**
Core Paper-III (4Credits)	**Cell Biology (BOC-103)**	**Biochemistry, Biophysics and Instrumentation (BOC-203)**	**Plant Ecology (BOC-303)**	**Plant Resources Utilization and Conservation (BOC-403)**
Core Paper-IV (4Credits)	**Genetics & Evolution (BOC-104)**	**Research methodology, Biostatistics, IPR and Biosafety (BOC-204)**	**Plant Physiology (BOC-304)**	**Horticulture and Plant Breeding (BOC-404)**
Elective-I (2 Credits) (Any One)	**Biofertilizer Technology (BOE-101)**	**Plant Tissue Culture (BOE-201)**	**Air Pollution and Climate Change (BOE-301)**	**Bioinstrumentation (BOE-401)**
	Environmental Biology (BOE-102)	**River Ecology and Water Management (BOE-202)**	**Herbal Medicine (BOE-302)**	**Conservation and Restoration Ecology (BOE-402)**
	Biodiversity (BOE-103)	**Bioinformatics (BOE-203)**	**Biostatistics (BOE-303)**	**Photobiology, Molecular Microbiology and Synthetic Biology (BOE-403)**
Core Practical - I (2 Credits)	**BOP-101 On the basis of BOC-101 & 102**	**BOP-201 On the basis of BOC-201&202**	**BOP-301 On the basis of BOC-301 & 302**	**BOP-401 On the basis of BOC-401 & 402**
Core Practical-II (2 Credits)	**BOP-102 On the basis of BOC-103 & 104**	**BOP-202 On the basis of BOC-203 & 204**	**BOP-302 On the basis of BOC- 303 & 304**	**BOP-402 On the basis of BOC-403 & 404**
				OR
				BOC-401, 402, 403 & Minor Dissertation
				OR
				Major Dissertation

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Detailed Course Pattern for Each Semester

M. Sc. Part-1: Semester - I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-1	Core-I	2:30	70	30	100	4	4
Paper-2	Core-II	2:30	70	30	100	4	4
Paper-3	Core-III	2:30	70	30	100	4	4
Paper-4	Core-IV	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core-I & II)	Pract. -I	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core-III & IV)	Pract -II	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

M. Sc. Part-1: Semester – II

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-5	Core-V	2:30	70	30	100	4	4
Paper-6	Core-VI	2:30	70	30	100	4	4
Paper-7	Core-VII	2:30	70	30	100	4	4
Paper-8	Core-VIII	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core-V & VI)	Pract-III	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core-VII & VIII)	Pract-IV	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

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M. Sc. Part-2: Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-9	Core-IX	2:30	70	30	100	4	4
Paper-10	Core-X	2:30	70	30	100	4	4
Paper-11	Core-XI	2:30	70	30	100	4	4
Paper-12	Core-XII	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core - IX & X)	Pract-V	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core - XI & XII)	Pract-VI	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

M. Sc. Part-2: Semester -IV

Course	Name of the Course	Exam. Duration	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-13	Core-XIII	2:30	70	30	100	4	4
Paper-14	Core-XIV	2:30	70	30	100	4	4
Paper-15	Core-XV	2:30	70	30	100	4	4
Paper-16	Core-XVI	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core - XIII & XIV)	Pract-VII	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core - XV & XVI)	Pract-VIII	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

OR

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-13	Core-XIII	2:30	70	30	100	4	4
Paper-14	Core-XIV	2:30	70	30	100	4	4
Paper-15	Core-XV	2:30	70	30	100	4	4
Minor Dissertation	---	10 (5 X 2 Days)	300	---	300	12	12
Total	---		**510**	**90**	**600**	**24**	**24**

OR

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Major Dissertation	---	15 (5 X 3 Days)	600	---	600	24	24
Total	---	---	**600**	---	600	**24**	**24**

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General format / design of core course
Question paper style / Pattern for Semester end examination

The semester- end examination question paper shall have following format:

Question paper will be set in the view of the / in accordance with the entire Syllabus and preferably covering each unit of the Syllabi.

Question-1(From Unit - 1)	**18 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following - Short Notes / Differences / Comparison (One out of two)	07 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

Question – 2 (From Unit - 2)	**17 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following Short Notes / Differences / Comparison (One out of two)	06 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

Question – 3 (From Unit - 3)	**18 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following - Short Notes / Differences / Comparison (One out of two)	07 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

Question – 4 (From Unit - 4)	**17 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following Short Notes / Differences / Comparison (One out of two)	06 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

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General format / design of Elective course
Question paper style / Pattern for Semester end examination

The semester – end examination question paper shall have following format

Question paper will be set in the view of the / in accordance with the entire Syllabus and preferably covering each unit of the Syllabi

Question- 1 (From Unit - 1)	**14 marks**
(A) Answer the following –Long answer question (One out of two)	08 marks
(B) Answer the following – Medium answer question (One out of two)	06 marks
Question – 2 (From Unit - 2)	**14 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following – Medium answer question (One out of two)	06 marks
Question – 3 (From Unit -1 & 2)	**07 marks**

Answer the following – Very short answer question (Seven out of ten)

(Unit wise five questions)

In One word, Fill in the gap, Objective type questions.

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M. Sc. BOTANY – SEMESTER- II

CORE PAPERS

BOC-201	Biology and Diversity-II (Bryophytes and Pteridophytes)
BOC-202	Plant Development and Reproduction
BOC-203	Biochemistry, Biophysics and Instrumentation
BOC-204	Research methodology, Biostatistics, IPR and Biosafety

PRACTICAL PAPERS:

BOP-201	Practical Based on Topics Covered in BOC-201 & BOC-202
BOP-202	Practical Based on Topics Covered in BOC-203 & BOC-204

ELECTIVE PAPERS:

Choice-based: Student should select any one course from the following.

BOE-201	Plant Tissue Culture
BOE-202	River Ecology and Water management
BOE-203	Bioinformatics

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BOC-201

Biology and Diversity-II (Bryophytes and Pteridophytes)

(Credit-4)

Unit:I: Bryophytes-I

- Morphology, anatomical structure, reproduction and life history; distribution; classification; general account and comparative study of Marchantiales, Jungermaniales, Anthocerotales, Sphagnales and Bryales.
- Origin of bryophytes.
- Economic and ecological importance.
- Vegetative propagation in Bryophytes.

Unit:II: Bryophytes-II

- Morphological and anatomical study of thallus and reproductive structures of *Riccia*, *Plagiochasma*.
- Morphological and anatomical study of thallus and reproductive structures of *Anthoceros.*
- Morphological and anatomical study of thallus and reproductive structures of *Sphagnum* and *Polytrichum*.
- Evolution of Sporophytes in Bryophyta.

Unit: III: Pteridophytes-I

- Morphology, anatomical structure, reproduction and life history; distribution; classification; general account of Psilopsida, Lycopsida, Sphenopsida and Pteropsida.
- Economic and ecological importance.
- Heterospory and origin of Seed habit, Telome theory.
- Apospory and Apogamy.

Unit: IV: Pteridophytes-II

- Morphological and anatomical study of thallus and reproductive structures of *Psilotum.*
- Morphological and anatomical study of thallus and reproductive structures of *Lycopodium* and *Isoetes.*
- Morphological and anatomical study of thallus and reproductive structures of *Osmunda* and *Marsilea*.
- Types and evolution of Stele in Pteridophyta.

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Suggested readings:

- Parihar NS (1973) An Introduction to Embryophyta, Vol I (Bryophyta) and Vol II (Pteridophyta), Central Book Department, Allahabad.
- Sambamurty AVSS (2005) A Textbook of Bryophytes, Pteridophytes, Gymnosperm and Palaeobotany, IK International Pvt Ltd, New Delhi.
- Rashid A (2011) An Introduction to Pteridopyta, 2nd edition, Pub Vikas Publishing House Pvt Ltd, Noida.
- Singh V. Pande P.C. and Jain D.K (2008-09) A Taxt book of Botany, Rastogi Publications, Meerut.
- Vashishta B.R. and Sinha A.K. (2007) Botany for Degree students-Bryophytes & Pteridophytes, S.Chand & Company Ltd. New Delhi.

Laboratory Work Based on Topics Covered in BOC-201

(A) Bryophytes:

Study of morphology, anatomy and reproductive structures of following Bryophytes:

- *Riccia*
- *Plagiochasma*
- *Anthoceros*
- *Sphagnum*
- *Polytrichum*

.

(B) Pteridophytes:

Study of morphology and anatomy of following Pteridophytes:

1. *Psilotum*
2. *Lycopodium*
3. *Isoetes*
4. *Osmunda*
5. *Marsilea*

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BOC-202
PLANT ANATOMY AND REPRODUCTION
(Credit-4)

UNIT-I: Plant Development

- Meristems: concept and Classification of Meristems.
- Theories of Shoot Apical meristems, Apical Cell Theory, Histogen theory, Anneuainitial & meristem d'attente theory.
- Vascular Elements: Xylem, Phloem, Transfusion tissue.
- Secretory ducts and laticifers tissues.
- Root Apex: Theories of Root apex organization, Apical Cell Theory, Korper- Kappe theory, Concept of quiescent centre, development of lateral roots and root hairs.
- Wood Anatomy: Ontogeny of secondary vascular tissues, Growth rings, Heart wood & Sap wood, Porous & non-porous wood, wood parenchyma.

UNIT-II: Plant Anatomy

- Vascular Cambium: origin, structure, seasonal changes in cambium activity, cambium in monocotyledons.
- Anomalous Secondary Growth in *Aristolochia* stem, *Mirabilis* stem, *Bougainvillea* stem and *Chenopodium* stem.
- Anatomy of Structural variability in Leaves of *Helianthus, Aloe, Typha, Nymphaea* and *Maize.*
- Systematic Plant Anatomy: with special references to Trichomes, Stomata, leaf anatomy, nodal anatomy, cellular contents.

UNIT-III: Plant Reproduction

- Microsporangium: Introduction, structure of Anther, anther wall, Sporogenous tissue, Microsporogenesis, role of tapetum.
- Male gametophyte: Introduction, morphology, pollen development, Formation of vegetative cell and generative cells.
- Pollen Structure: Pollen wall features, Scope of Palynology, preparation of pollen grains.
- Megasporangium: Introduction, Structure of ovules, its integuments, ovule development, process of megasporogenesis.

UNIT-IV: Plant Reproduction

- Female gametophyte: Organization of embryosacs, structure of embryosac cells, developments of mature embryo sac, types of embryosac development.
- Fertilization: pollen germination, pollen tube growth, *in-vitro* pollen germination, fertilization and double fertilization.
- Endosperm: Structure and development during early, maturation and desiccation stages, protein of endosperm and embryo.
- Embryogenesis: Ultrastructure and nuclear cytology and processes of Embryogenesis, polyembryony in plant, Definition, types and applications.

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Suggested readings:

1. Singh V, Pande P C and Jain D K (1998) Anatomy of Seed Plants, Rastogi Publications, Meerut (1st Edition's Reprint).
2. Pandey B P (1997) Plant Anatomy, S Chand & Co. Ltd, New Delhi. (1st Edition's Reprint).
3. E John Jothi Prakash (2000) A Text Book of Plant Anatomy, Emkay Publications, Delhi. (2nd Revised Edition).
4. Tayal M S (2001) Plant Anatomy, Rastogi Publications, Meerut (5th Edition's New Delhi (1st Edition's Reprint)
5. Reddy S M, Madhusudana Rao M, Reddy S A, Reddy M M and Chary J S (2004) University Botany-3, New Age International (P) Ltd, Publishers, New Delhi (1st Edition).
6. Pandey B P (2003) Simplified Course in Botany –B Sc-II, S Chand & Company Ltd.,
8. Bhojwani S S and Bhatnagar S P (2001) The Embryology of Angiosperms, Vikas Publishing House Pvt Ltd., New Delhi (4th Revised Edition's Reprint).
9. Maheshwari P (1989) An Introduction to the Embryology of Angiosperms, Tata McGraw-Hill Publishing Company Ltd., New Delhi (10th Edition's Reprint).

Laboratory Work Based on Topics Covered in BOC-202

PLANT DEVELOPMENT

1. To study the vegetative/reproductive shoot apices of *Hydrilla*, *Ceratophyllum*, Grass.
2. To study the root apices of *Eichhornia*, *Lemna*, *Allium*.
3. To study the Plant Tissues from fresh material and permanent slides: Parenchyma, Aerenchyma, Chlorenchyma, Collenchyma, Sclerenchyma, Xylem, Phloem, Transfusion tissue.
4. To study the secretory ducts and laticifers from suitable plant material.
5. To study the Wood Anatomy from locally available wood specimens (*Acacia, Tectona, Azadirechta*).
6. To study the Structural variability in the Leaves of *Helianthus*, *Aloe*, *Typha*, *Nymphaea* and *Maize*.
7. To study the comparative examples of Systematic Plant Anatomy with special references to trichomes, stomata, leaf anatomy, nodal anatomy, cellular contents.

PLANT REPRODUCTION

8. To study the young and matured anther T.S.
9. Tests for pollen viability using stains and *in vitro* germination. Pollen germination using hanging drop and sitting drop cultures, suspension culture and surface culture.
10. To dissect out endosperm haustoria with embryo of cucumber seed.
11. To dissect out Embryo with suspensor and basal cell from *Brassica* seeds.
12. To Study the polyembryony from *Citrus* seeds.
13. To study Microsporogenesis through squash method in *Ipomea* flower buds.

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BOC-203
BIOCHEMISTRY, BIOPHYSICS AND INSTRUMENTATION

(Credit-4)

Unit I: Biochemistry-I

- Behavior of Biological Compounds: Solubility, Isomerism, Adsorption, Chemical bonds, Ionization of Water.
- Carbohydrates: Classification of carbohydrates, Occurrence, Structure and Function of Monosaccharides (Triose, Pentose and Hexose), Disaccharides and Polysaccharides (Starch and Cellulose). Carbohydrates as informational Molecules: The Sugar Code.
- Lipids: Classification of Lipids, Occurrence, Structure and Function of Simple lipids (Triglycerides and Waxes) and Complex lipids (Phospholipids and Sphingolipids), Oxidation of fatty acids, Biosynthesis of Phospholipids.
- Amino Acids: Structure, Properties, and Classification of Amino Acids, Amino Acids metabolism (Biosynthesis and Degradation of Amino Acids).

Unit II: Biochemistry-II

- Proteins: classification and structure of Proteins, Function and Conformation of Proteins (Ramachandran Plot).
- Protein denaturation and stability, Importance of Proteins.
- Enzymes: An introduction to Enzymes, Nomenclature, Classification of Enzymes. Properties of enzymes, Mechanism of enzyme action, Enzyme and Enzyme kinetics, Types of inhibition, Enzyme Regulation, Factors affecting the enzyme action.
- Vitamins: Occurrence, Classification, Structure and function of various Vitamins and their deficiency diseases.

Unit III: Biophysics

- pH and Buffers, Buffering against pH changes in Biological systems.
- Free radicals, charge transfer complex (CTC) and Redox potentials.
- Law of Thermodynamics.
- Radiations and isotopes and their role/ application in plant sciences.

Unit IV: Instrumentation

- Molecular analysis using UV/Visible, fluorescence, NMR and ESR spectroscopy.
- Photometry, colorimetry and spectrophotometry, their application.
- Principles and application of gel-filtration, ion exchange and affinity, chromatography: Paper chromatography, thin layer and gas chromatography, HPTLC.
- Electrophoresis: PAGE, Agarose gel electro-phoresis and electro-focusing, Ultra- centrifugation: Principles and types.

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Suggested Readings:

- Lehninger A C, Biochemistry.
- Deb A C (2008), Fundamentals of Biochemistry, New Central Book (P0 Ltd, Kolkata (9th Edition Revised).
- Jain J L, Jain Sanjaya and Jain Nitin (2005) Fundamentals of Biochemistry, S Chand & Co. Ltd, New Delhi.
- Satyanarayana U (1999), Biochemistry.
- Verma S K and Verma Mohit, Plant Physiology, Biochemistry and Biotechnology. Biophysics by Vasantha Pattabhi and N. Gautam, Narosa Pub.
- Introduction to Biophysics by Pranabkumar Banejee, S Chand.
- Research methodology for biological sciences, N Gurumani, MJP Publishers, Chennai.

Laboratory Work Based on Topics Covered in BOC-203

A. Major practical:

- Prepare Standard curve of Starch using standard method.
- Standard curve of Glucose (reducing Sugar) by using standard method.
- Standard curve of Amino Acids using standard method.
- Standard curve of protein using standard method.
- Standard curve of IAA using standard method.
- Extraction and Estimation of Starch from plant sample.
- Extraction and estimation of reducing sugar from plant sample.
- Extraction and estimation of Amino acids from plant sample.
- Estimation of Protein from plant sample.
- Determination of Amylase activity.
- Determination of Peroxidase activity.
- Determination of IAA oxidase activity.

B. Minor practical:

- Separation and identification of Sugar by paper chromatography.
- Separation and identification of Amino acids by paper chromatography.
- Separation and identification of Plant pigments by paper chromatography.
- Estimation of seed proteins depending upon the solubility.
- Determination of Isoelectric point of Casein.
- Estimation of free fatty acids by titration.

C. General Practical:

- Determination of pH from fruits/plant sample.
- Preparation of Buffers and buffering actions.
- Identification of different sugars (spot tests).

D. Principle and working of

- Colorimeter
- Spectrophotometer.
- Electrophoresis.
- Centrifugation.
- pH meter
- Chromatography technique.

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BOC-204

Research methodology, Biostatistics, IPR and Biosafety

(Credit-4)

UNIT - I: Research methodology-I

- Characteristics and types of scientific research
- Basics of research methodology
- Research and Experimental design
- Method of Data collection

UNIT - II: Research methodology-II

- Scientific Deliveries and Communications: Writing Research proposal, Paper, Thesis, Report and Citations.
- Citations, H-Index, I10-Index, Impact factor and selection criteria of scientific journals for research publications.
- Presenting scientific research: Power point presentations, Posters, Flyers, etc.
- Publication processes, Review Processes and Significance of scientific communications.

UNIT–III: Biostatistics

- Statistical Methods: Data analysis- variables, numerical, categorical Central measures (mean, medium, mode); Dispersion measures (range, mean & standard deviation), variance, standard error.
- Co- relation and regression, Binomial, poisson and normal distribution.
- Parametric (t-test, f-test, chi-square test, ANOVA) and Non-Parametric tests (Rank test, F-max test, Mann –Whitney (U) test, and Sign test).
- Mathematical Definition and theory of Probability, Marginal Probability and Conditional Probability. Mutual exclusive & Independent Events. Some simple laws of probabilities (Statements only).

UNIT–IV: IPR and Biosafety

- Introduction to IPR, forms of IPR and Intellectual property protection.
- Concept of property with respect to intellectual creativity, Tangible and Intangible property. WTO: agency controlling trade among nations, WTO with reference to Biotechnological affairs, TRIPs. WIPO, EPO. Concept related to patents novelty, non-obviousness, utility, anticipation, prior art etc. Type of patents. Indian patent act and foreign patents.
- Biosafety: Definition and level of bio-safety, Biotechnology and bio-safety concerns at the level of individuals, institutions, society, region, country and world with special emphasis on Indian concerns.
- Biosafety in laboratory institution: laboratory associated infection and other hazards, assessment of biological hazards and level of Biosafety.

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Suggested Readings:

1. P.S.G. Kumar (2004). Research methods and statistical techniques. B. R. publishing Academy, Udaipur.
2. Anthony M. Graziano A. M. And Raulin M. L. (2009). Research Methods: A Process Of Inquiry Allyn And Bacon
3. G. B. N. Chainy, G. Mishra and P. K. Mohanty (2004) Basic Biostatistics. Kalyani Publisher.
4. N. Gurumani (2006). Research Methodology for Biological Sciences. M J P Publishing, Chennai.
5. C. R. Kothari (2004). Research Methodology-Methods and Techniques, New Age Publ. Wiley Eastern, 1985.
6. Dawson, Catherina (2002). Practical Res. Methods. New Delhi. U B S Publ.
7. Coley S. M., and Scheinberg C. A., (1990), "Proposal Writing", Sage Publications Fink A. (2009). Conduction Research Literature Reviews: From the Internetto Paper. Sage Publications
8. Kumar Ranjit (2005). Res. Methodology. A step by step Guide for Beginners. Singapore, Pearson Education.
9. P. N. Arora and P. K. Malhan (1998). Biostatistics. Himalaya Publishing Bombay. Carlos C. M., 2000. Intellectual Property Rights The WTO and Developing Countries: The Trips Agreement and Policy Options, Zed Books New Yorks.
10. Satarkar S. V., 2000. Intellectual Property Rights and Copy Rights Ess Publications
11. Website for guidelines on Indian Biosafety Safety Rules &Regulations :http://dbtbiosafety.nic.in/

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Laboratory Work Based on Topics Covered in BOC-204

Research methodology

- To learn the preparation of Research Proposal and submit at least one proposal. To learn and prepare research paper review, book review.
- Various examples of Mean, Median, Mode and Analysis of Variance.
- Various examples of Mean and Standard Deviation, Standard error, Variance.
- Regression. Various examples of Probability.
- t-test, f-test, chi-square test, ANOVA.
- IPR and Biosafety.
- Study through chart/models.
- To identify the problems of your area and innovative ideas apply to resolve it. Study at least 05 patents and list it.
- Study the Biosafety measures of your institutions and your suggestions.

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M.Sc. Botany Semester-II

Botany Practical Examination, April/May-20 BOP-201

(Based on Topics Covered in BOC-201&BOC-202)

(Biology and Diversity – II (Bryophytes and Pteridophytes), Plant Development and Reproduction)

Date : / / 202 Place :

Time : 5 Hours Maximum Marks : 75

Instruction: Students are requested to follow instructions given by the examiners

Q.1: Identify and Classify given Specimens "**A**" and "**B**". 08

Q.2: Identify and describe with diagrams the structural peculiarities observed in the given specimens "**C**" and "**D**". 08

Q.3: Expose and make temporary slide of the reproductive organ from the given specimen "**E**" and "**F**" and show your preparation to the examiner. 08

Q.4: Make the temporary stained preparation of shoot apex/root apex from the given material "**G**". Draw a labled diagram and show your preparation to examiner. 07

Q.5: Make temporary stained preparation from given plant material "**H**" and show your slide to the examiner (Xylem/Phloem/Trichomes/Stomata/ secretory ducts and laticifers). 07

Q.6: Expose, mount and show your preparation to examiner. From given material "**I**" (Embryo with endosperm haustorium/Embryo with suspensor/ Diad/Tetrad/Tapetum). 07

Q.7: (a) Identify and describe peculiarities seen in slide "**J**" and "**K**". 06
(b) Identify and describe slide **"L"** and **"M"** . 06
(c) Comment upon: wood anatomy (*Acacia/Tectona/Azadirechta*). 03

Q.8: (a) Journal 03
(b) Submission/Botanical Tour Report 05
(c) Viva-voce 07

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M.Sc. Botany Semester-II

Botany Practical Examination,

April/May-21 BOP-202

(Based on Topics Covered in BOC-203 & BOC-204)

(Biochemistry, Biophysics and Instrumentation, Research methodology, Biostatistics, IPR and Biosafety)

Date : / / 20 Place :

Time : 5 Hours Maximum Marks : 75

Instruction : Students are requested to follow instructions given by the examiners

Q.1: Perform the Major Experiment assigned to You.___ 12
Tabulate your observation and draw graph. Show the result and/or conclusion to the examiner.

Q.2: Perform the Minor Experiment assigned to You____ 10
Tabulate your observation and draw graph. Show the result and/or conclusion to the examiner.

Q.3: Perform the General Experiment assigned to You___ 08
Show the result and/or conclusion to the examiner.

Q.4: Prepare and Submit the Research Proposal to the examiner. 12

Q.5: Solve the statistical problems (Based on theory) 12

(a)……..

(b)…….

Q.6: Comment upon the given Spot- "**C**" and "**D**". 06

Q.7. (a) Journal 03
(b) Submission 05
(c) viva-voce 07

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BOE-201

PLANT TISSUE CULTURE

(Credit-2)

UNIT- 1

- Plant cell and tissue culture: Introduction, Histroy, Scope, Concept of Cellular differenciation, Totipotency and Application.
- Laboratory organization, Media Preparation and sterilization techniques.
- Types of culture, callus and its types, Micropropogation.
- Somatic Hybridization, Protoplast isolation, fusion and culture, Hybrid selection regeneration.

Unit-2:

- Clonal propagation, Artificial seed production and Biotechnological production of plant secondary metabolites.
- Transgenic plants and crop protection: Pathogen and Herbicide resistant plants, Oxidative stress and Salt stress resistant plants.
- Molecular farming: Production of Antibodies, Vaccines, Polymers and Bioplastic
- Germplasm storage and Cryopreservation.

Suggested Readings:

- Bhojwani SS, Razdan MK (1996) Plant tissue culture: theory and practice, 1st editition, Elsevier, New Delhi.
- Sambrook J, Russell DW (2001) Molecular Cloning: a laboratory manual, 3rd edition, Cold Spring Harbor Laboratory Press, New York.

BOE-202

RIVER ECOLOGY AND WATER MANAGEMENT

(Credit-2)

Unit-1:

- Watershed hydrology, river continuum
- Plankton and benthic communities, paradox of plankton, primary productivity, trophic cascades, microbial loop
- Eutrophication and concept of nutrient limitation
- Integrated river basin management, case studies related to the river Ganga,Sabarmati.

Unit-2:

- General characteristics of water, factors influencing surface water
- Water pollution: Sources and consequences, ground water pollution, water quality standards
- Waste water: Flows and characteristics, collection system, waste water treatment, drinking water processing.
- Environmental management plans, Sustainability principles in water management, water use, groundwater recharge, recharging of aquifers

Suggested Readings:

- Wetzel RG (2001) Limnology- Lakes and River Ecosystem, Academic Press, California.
- Kalff J (2002) Limnology- Inland Water Ecosystem, Prentice Hall, California.
- Liken GE (2010) River Ecosystem Ecology- A global perspective, Academic Press, New York.
- Gray NF (2010) Water Technology, A Butterworth-Heinemann, Oxford.
- Vesilind PA, Morgan SM (2010) Introduction to Environmental Engineering, CL Engineering, Stamford.
- Hammer MJ, Hammer Jr MJ (2008) Water and Waste water Technology, Prentice Hall, New Jersey.

BOE-203
BIOINFORMATICS
(Credit-2)

Unit-1

- Introduction to Bioinformatics, Overview, Internet and Bioinformatics Application
- Database: Database in Bioinformatics, Various biological database, Protein and Nucleotide sequence Database. Protein sequence, structure and classification database, pathway database.
- Sequence analysis: Pairwise alignment, local and global alignment, Scoring matrices, multiple sequence alignment, tools for sequence alignment, programming algorithms.

Unit-2

- Gene prediction: Gene structure in Prokaryotes and Eukaryotes, Gene prediction methods: Neural Networks, Pattern Discrimination methods, Signal sites predictions, Evaluation of Gene prediction methods.
- Transcriptomics: Complete transcript cataloguing and gene discovery- sequencing based approach, Microarray based technologies and data analysis.
- RNA secondary structure prediction.
- Introduction to Chemi-informatics.

Suggested readings:

- Patilv C. S., Ajit Gangawane and Srinath Rao, Bioinformatics and Bioinformation (2011) APH Publishing Corporation. NewDelhi.
- Arumugam N., Gopi A., Sundaralingam R., Meena A., and Kumarasen V (2010)
- Biostatistics Computer Application Bioinformatics instrumentation Saras publication Nagar coil (TN).
- Irfan A Khan and Atiya Khanum, Emerging trends in Bioinformatics (2002) Ukaaz Publications Hyderabad.
- Padmini E. Biochemical calculations and Biostatistics (2007) Books and Allied (P.) Ltd. Kolkata
- Sudara Rajan S. and Balaji R. Introduction to Bioinformatics (2003) Himalaya Publishing House.
- Dhamu K. P. and Ramamoorthy K (2009) Fundamentals of Agriculture Statistics Scientific publishers (India) Jodhpur.
- Sharrma T. R. (2009) Genome Analysis and Bioinformatics I. K. International Publishing House Pvt. Ltd. New Delhi.

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FACULTY OF SCIENCE

M.Sc. BOTANY

Semesters: III

SYLLABUS

PROGRAM : HNGU 2059

Curriculum as per UGC Guideline

With Semester/CBCS/Grading Pattern

With effect from June - 2022 (and thereafter)

Submitted on
Date: 07/04/2021

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TOTAL PAGE: 25

Proposed Details of Course pattern and scheme of examination

Sem.	Course	Interaction (hrs/week)	Duration of Exam(hrs)	Marks			Credit
				Internal	External	Total	
Sem.-I	Core Paper-I	4	2.30	30	70	100	4
	Core Paper-II	4	2.30	30	70	100	4
	Core Paper-III	4	2.30	30	70	100	4
	Core paper-IV	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-I	2	2.00	15	35	50	2
	Practical (Based on core paper-I & II, III & IV)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-II	Core Paper-V	4	2.30	30	70	100	4
	Core paper-VI	4	2.30	30	70	100	4
	Core paper-VII	4	2.30	30	70	100	4
	Core Paper-VIII	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-II	2	2.00	15	35	50	2
	Practical (Based on core paper-V&VI,VII&VIII)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-III	Core Paper-IX	4	2.30	30	70	100	4
	Core paper-X	4	2.30	30	70	100	4
	Core paper-XI	4	2.30	30	70	100	4
	Core paper-XII	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-III	2	2.00	15	35	50	2
	Practical (Based on core paper-IX & X, XI & XII)	6	10(5X2days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-IV	Core Paper-XIII	4	2.30	30	70	100	4
	Core Paper-XIV	4	2.30	30	70	100	4
	Core Paper-XV	4	2.30	30	70	100	4
	Core Paper-XVI	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-IV	2	2.00	15	35	50	2
	Practical (Based on core paper-)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
OR							
Sem-IV	Core Paper-XIII	4	2.30	30	70	100	4
	Core Paper-XIV	4	2.30	30	70	100	4
	Core Paper-XV	4	2.30	30	70	100	4
	Minor Dissertation	12	10 (5X2 days)	-	300	300	12
	Total	**24**		**90**	**510**	**600**	**24**
OR							
Sem-IV	Major Dissertation	24	15 (5X3 days)	--	600	600	24
	Total	**24**			**600**	**600**	**24**

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Programme: M. Sc. BOTANY (CBCS)
Syllabus with effective from: June–2021

M. Sc. Botany				
Semester	**I**	**II**	**III**	**IV**
Core Paper-I (4Credits)	**Biology and Diversity-I** (Virus, Bacteria, Algae and Fungi) And Plant Pathology **(BOC-101)**	**Biology and Diversity-II** (Bryophytes, and Pteridophytes) **(BOC-201)**	**Biology and Diversity-III** (Gymnosperms and Fossils) **(BOC-301)**	**Plant Biotechnology (BOC-401)**
Core Paper-II (4Credits)	**Plant Taxonomy (BOC-102)**	**Plant Development and Reproduction (BOC-202)**	**Molecular Biology of Plants (BOC- 302)**	**Ethnobotany, Mushrooms and Mycorrhiza (BOC-402)**
Core Paper-III (4Credits)	**Cell Biology (BOC-103)**	**Biochemistry, Biophysics and Instrumentation (BOC-203)**	**Plant Ecology (BOC-303)**	**Plant Resources Utilization and Conservation (BOC-403)**
Core Paper-IV (4Credits)	**Genetics & Evolution (BOC-104)**	**Research methodology, Biostatistics, IPR and Biosafety (BOC-204)**	**Plant Physiology (BOC-304)**	**Horticulture and Plant Breeding (BOC-404)**
Elective-I (2 Credits) (Any One)	**Biofertilizer Technology (BOE-101)**	**Plant Tissue Culture (BOE-201)**	**Air Pollution and Climate Change (BOE-301)**	**Bioinstrumentation (BOE-401)**
	Environmental Biology (BOE-102)	**River Ecology and Water Management (BOE-202)**	**Herbal Medicine (BOE-302)**	**Conservation and Restoration Ecology (BOE-402)**
	Biodiversity (BOE-103)	**Bioinformatics (BOE-203)**	**Biostatistics (BOE-303)**	**Photobiology, Molecular Microbiology and Synthetic Biology (BOE-403)**
Core Practical - I (2 Credits)	**BOP-101 On the basis of BOC-101 & 102**	**BOP-201 On the basis of BOC-201&202**	**BOP-301 On the basis of BOC-301 & 302**	**BOP-401 On the basis of BOC-401 & 402**
Core Practical-II (2 Credits)	**BOP-102 On the basis of BOC-103 & 104**	**BOP-202 On the basis of BOC-203 & 204**	**BOP-302 On the basis of BOC- 303 & 304**	**BOP-402 On the basis of BOC-403 & 404**
				OR
				BOC-401, 402, 403 & Minor Dissertation
				OR
				Major Dissertation

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Detailed Course Pattern for Each Semester

M. Sc. Part-1: Semester - I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-1	Core-I	2:30	70	30	100	4	4
Paper-2	Core-II	2:30	70	30	100	4	4
Paper-3	Core-III	2:30	70	30	100	4	4
Paper-4	Core-IV	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core-I & II)	Pract. -I	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core-III & IV)	Pract -II	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

M. Sc. Part-1: Semester – II

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-5	Core-V	2:30	70	30	100	4	4
Paper-6	Core-VI	2:30	70	30	100	4	4
Paper-7	Core-VII	2:30	70	30	100	4	4
Paper-8	Core-VIII	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core-V & VI)	Pract-III	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core-VII & VIII)	Pract-IV	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

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M. Sc. Part-2: Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-9	Core-IX	2:30	70	30	100	4	4
Paper-10	Core-X	2:30	70	30	100	4	4
Paper-11	Core-XI	2:30	70	30	100	4	4
Paper-12	Core-XII	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core - IX & X)	Pract-V	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core - XI & XII)	Pract-VI	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

M. Sc. Part-2: Semester -IV

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-13	Core-XIII	2:30	70	30	100	4	4
Paper-14	Core-XIV	2:30	70	30	100	4	4
Paper-15	Core-XV	2:30	70	30	100	4	4
Paper-16	Core-XVI	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core - XIII & XIV)	Pract-VII	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core - XV & XVI)	Pract-VIII	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

OR

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-13	Core-XIII	2:30	70	30	100	4	4
Paper-14	Core-XIV	2:30	70	30	100	4	4
Paper-15	Core-XV	2:30	70	30	100	4	4
Minor Dissertation	---	10 (5 X 2 Days)	300	---	300	12	12
Total	---		**510**	**90**	**600**	**24**	**24**

OR

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Major Dissertation	---	15 (5 X 3 Days)	600	**---**	600	24	24
Total	---	---	**600**	---	**600**	**24**	**24**

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General format / design of core course
Question paper style / Pattern for Semester end examination

The semester- end examination question paper shall have following format:

Question paper will be set in the view of the / in accordance with the entire Syllabus and preferably covering each unit of the Syllabi.

Question-1(From Unit - 1)	**18 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following - Short Notes / Differences / Comparison (One out of two)	07 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

Question – 2 (From Unit - 2)	**17 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following Short Notes / Differences / Comparison (One out of two)	06 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

Question – 3 (From Unit - 3)	**18 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following - Short Notes / Differences / Comparison (One out of two)	07 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

Question – 4 (From Unit - 4)	**17 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following Short Notes / Differences / Comparison (One out of two)	06 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

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General format / design of Elective course
Question paper style / Pattern for Semester end examination

The semester – end examination question paper shall have following format

Question paper will be set in the view of the / in accordance with the entire Syllabus and preferably covering each unit of the Syllabi

Question- 1 (From Unit - 1)	**14 marks**
(A) Answer the following –Long answer question (One out of two)	08 marks
(B) Answer the following – Medium answer question (One out of two)	06 marks
Question – 2 (From Unit - 2)	**14 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following – Medium answer question (One out of two)	06 marks
Question – 3 (From Unit -1 & 2)	**07 marks**

Answer the following – Very short answer question (Seven out of ten)

(Unit wise five questions)

In One word, Fill in the gap, Objective type questions.

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M. Sc. BOTANY – SEMESTER- III

CORE PAPERS

BOC-301 Biology and Diversity III (Gymnosperms and Fossils)

BOC-302 Molecular Biology of Plants

BOC-303 Plant Ecology

BOC-304 Plant Physiology

Practical Papers:

BOP-301 Practical Based on Topics Covered in BOC-301 & BOC-302

BOP-302 Practical Based on Topics Covered in BOC-303 & BOC-304

Elective Papers:

Choice – based: Student should select any one course from the following.

BOE-301 Air pollution and Climate Change

BOE-302 Herbal Medicine

BOE-303 Biostatistics

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BOC-301

BIOLOGY AND DIVERSITY-III

(GYMNOSPERMS AND FOSSILS)

(Credit-4)

Unit-I: Gymnosperms-I

- Introduction, Distribution, General characters.
- Origin, Evolution and Classification of Gymnosperms (Bierhost).
- Comparison of Angiosperms and Gymnosperms.
- Geological rise and fall of Gymnosperms. Economic importance of gymnosperms.

Unit-II: Gymnosperms-II

- Comparative account of habit, anatomy and reproduction of Cycadales: *Cycas* and *Zamia*.
- Comparative account of habit, anatomy and reproduction of Ginkgoales: *Ginkgo,*
- Comparative account of habit, anatomy and reproduction of Coniferales: *Pinus*, *Thuja.*
- Comparative account of habit, anatomy and reproduction of Gnetales: *Gnetum*, *Ephedra*.

Unit-III: Fossils-I

- Paleobotany – Objectives and Nomenclature.
- Geological timescale.
- Methods of Fossil study, Processes of plant fossilization: Impressions, Petrification.
- Technique of fossil study, factors affecting fossilization, work in fossils in India

Unit-IV: Fossils-II

- Study of morphology, anatomy and evolutionary trends of following groups of fossil plants: Psilophytales, Lepidodendrales.
- Study of morphology, anatomy and evolutionary trends of following groups of fossil plants: Calamitales, Filicales.
- Study of morphology, anatomy and evolutionary trends of following groups of fossil plants: Pteridospermales.
- Study of morphology, anatomy and evolutionary trends of following groups of fossil plants: Cycadales, Coniferales, Bennettitales, Pentoxylales, Cordiatales.

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Suggested Readings:

- Sporne K R (1967) Morphology of Gymnosperms, B I Publication, New Delhi.
- Bhatnagar S P, Moitra A (1996) Gymnosperms, New Age international Ltd Publication, New Delhi.
- Coulter and Chamberlin, J.M.(1978) Morphology of Gymnosperms. Central Book Depot, Allahabad
- Pandey B.P (1979) College Botany, Volume - II, S. Chand and Company, Delhi. (Reprint-2017)
- Biswas C and Johri B M(2004) The Gymnosperms, Narosa Publishing House, New Delhi.
- Vashishta PC (2005) Botany for Degree Students Gymnosperms, S.Chand and Company, Delhi.
- Hait G Bhattacharya K and Ghosh A K (2008) A TextBook of Botany, Vol-I New Central Book Agency (P) Ltd.Kolkata.
- Stewart W.N. and Rathwell G.W. 1993. Palaeobotany and Evolution of Plants. Shila A. C. and Mishra S. D.1975. Essentials of Palaeobotany.

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Laboratory Work Based on Topics Covered in BOC-301

1. Study of the morphology and anatomy of vegetative and reproductive parts of *Cycas, Zamia, Pinus, Thuja, Gnetum, Ephedra.*
2. Study of important fossil gymnosperms with Models, permanent slides, specimens and charts as per theory syllabus- Psilophytales, Lepidodendrales, Calamitales, Filicales, Pteridospermales, Cycadales, Coniferales, Bennettitales, Pentoxylales, Cordiatales.
3. Geological Time scale using chart.

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BOC-302
MOLECULAR BIOLOGY OF PLANTS
(Credit-4)

UNIT–I:

- Nucleic Acids: Introduction, Components, Chemical Structure of DNA, Forms of DNA and types of RNA and their functions.
- DNA Replication in Prokaryotes and Eukaryotes; Enzymes involved in Replication.
- Transcription in Prokaryotes and Eukaryotes; RNA Polymerases.
- Translation: Process of Protein synthesis.

UNIT-II:

- Regulation of gene expression in Prokaryotes and Eukaryotes.
- Proteomics and Proteome: Overview of analytical proteomics, protein digestion techniques, mass spectrometers for protein.
- Application of proteomics: Protein expression profiling, identifying protein-protein interactions.
- Human Genome Project.

UNIT-III:

- Recombinant DNA technology and Restriction Endonuclease (Types, Source and classification)
- Gene Cloning principles and technique; Choice of Vectors (Plasmid, Cosmid, Bacteriophage, Phasmid, Shuttle, Yeast and Expression vectors).
- Construction of Genomic and cDNA libraries.
- Southern and Northern Analysis.

UNIT-IV:

- DNA synthesis and sequencing.
- PCR (Polymerase Chain Reaction).
- DNA Fingerprinting (RFLP, RAPD, AFLP).
- DNA Microarray.

Suggested Readings:

- Alberts, B., Bray ,D., Lewis ,J., Raff, M., Roberts, K., and Watson, J.D. (1999). Molecular Biology of the Cell. Garland Publishing, Inc., New York.
- Wolfe, S.L. (1993). Molecular and Cellular Biology. Wadsworth Publishing Co., California, USA.
- Krishnamurthy, K.V. (2000). Methods in Cell Wall Cytochemistry. CRC Press, Boca Raton, Florida.
- Buchanan, B.B., Gruissem,W. and Jones,R.L. (2000). Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA
- Kleinsmith, L.J. and Kish,V.M. (1995). Principles of Cell and Molecular Biology. Harper Collins College Publishers, NewYork, USA.
- Lodish,H., Berk,A., Zipursky,S.L., Matsudaira,P., Baltimore,D. and Darnell,J. (2000). Molecular Cell Biology (41Edition). W.H.Freem anand Co., NewYork, USA.
- Glick, B.R. and Thompson, J.E. (1993). Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton, Florida.
- Glover, D.M. and Hames, B.D. (Eds), (1995). DNA Cloning1: A Practical Approach; Core Techniques, 2nd edition. PAS, IRL Press at Oxford University Press, Oxford.
- Gunning, B.E.S. and Steer, M.W. (1996). Plant Cell Biology: Structure and Function. Jones and Bartlett Publishers, Boston, Massachusetts.
- Hackett,P.B., Fuchs,J.A. and Messing,J.W. (1988). An Introduction to Recombinant DNA Techniques: Basic Experiments in Gene Manipulation. The Benjamin / Cummings Publishing Co., Inc Menlo Park, California.
- Hall,J.L. and Moore,A.L. (1983). Isolation of Membranes and Organelles from Plant Cells. Academic Press, London, UK.
- Harris, N. and Oparka,K.J. (1994). Plant Cell Biology: A Practical Approach. IRLPress, at Oxford University Press, Oxford, U.K.Shaw, C.H. (Ed.), (1988). Plant Molecular Biology:A Practical Approach. IRL Press, Oxford.

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Laboratory Work Based on Topics Covered in BOC-302

1. To prepare standard curve of DNA.
2. Extraction and quantitative analysis of DNA by spectrophotometric method.
3. To prepare standard curve of RNA.
4. Extraction and quantitative analysis of RNA by spectrophotometric method.
5. Separation and analysis of proteins by SDS-PAGE.
6. Isolation of plant DNA using standard extraction method.
7. Estimation and analysis of DNA/RNA by Agarose gel Electrophoresis.
8. Demonstration of models and techniques as per theory syllabus by charts/ models/ photographs.

Note: Chemicals and kits for conducting some of the above molecular biology experiments are available in India, for example from M/s Bangalore Genei, and Centre for Biotechnology (CSIR), Mall Road, Delhi.

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BOC-303
PLANT ECOLOGY
(Credit-4)

Unit-I:

- Climate, soil and vegetation patterns of India.
- Phytogeography and major biomes of the world.
- Vegetation organization: Concepts of community; analysis of communities (analytical and synthetic characters); interspecific associations, concept of ecological niche.
- Vegetation development: Temporal changes (cyclic and non-cyclic); mechanism of ecological succession, changes in ecosystem properties during succession.

Unit-II:

- Ecosystem organization: Structure and functions; Production (primary & secondary). Measurement of primary productivity (harvest & leaf area index).
- Types of ecosystem: Natural and artificial ecosystems.
- Energy dynamics (trophic organization, energy flow pathways (Single & Y - shaped), ecological efficiencies; litter fall and decomposition, climatic factors (light, temperature, wind, precipitation).
- Global biogeochemical cycles of C, N, P and S, mineral cycles (pathways & processes).

Unit-III:

- Biological diversity: Concept and levels; role of biodiversity in ecosystem functions and stability; speciation and extinction.
- IUCN categories of threat; distribution and global patterns; terrestrial biodiversity hot spots.
- Air, water and soil pollution: Kinds; sources; quality parameters; effects on plants and ecosystems.

Unit-IV:

- Climate change: Greenhouse gases (CO_2, CH_4, N_2O, CFCs: sources, trends and role); ozone layer and ozone hole; consequences of climate change (CO_2 fertilization, global warming, sea level rise, UV radiation).
- Ecosystem stability: Concept, ecological perturbations (natural and anthropogenic) and their impact on plants and ecosystems; ecology of plant invasion; environmental impact assessment; ecosystem restoration.
- Ecological management: Concepts; sustainable development; sustainability indicators.

Suggested Readings:

- Smith, R.L. (1996). Ecology and Field Biology. Harper Collins, New York.
- Muller-Dombois, D. and Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology, Wiley, New York.
- Begon, M., Harper, J.L. and Townsend, C.R. (1996). Ecology. Blackwell Science, Cambridge, U.S.A.
- Ludwig, J. and Reynolds, J.F. (1988). Statistical Ecology. John Wiley & Sons. Odum, E.P. (1971). Fundamentals of Ecology. Saunders, Philadelphia.
- Odum, E.P. (1983). Basic Ecology. Saunders, Philadelphia.
- Barbour, M.G., Burk, J.H. and Pitts, W.D. (1987). Terrestrial Plant Ecology. Benjamin / Cummings Publication Company, California.
- Kormondy, E.J. (1996). Concepts of Ecology. Prentice-Hall of India Pvt. Ltd., New Delhi. Chapman, J.L. and Reiss, M.J. (1988). Ecology: Principles and Applications. Cambridge University Press, Cambridge, U.K.
- Moldan, B. and Billharz, S. (1997). Sustainability Indicators. John Wiley & Sons, New York. Treshow, M. (1985). Air Pollution and Plant Life. Wiley Interscience.
- Heywood, V.H. and Watson, R.T. (1995). Global Biodiversity Assessment. Cambridge University Press.
- Mason, C.F. (1991). Biology of Freshwater Pollution. Longman.
- Hill, M.K. (1997). Understanding Environmental Pollution. Cambridge University Press. Brady, N.C. (1990). The Nature and Properties of Soils. MacMillan

Laboratory Work Based on Topics Covered in BOC-303

- Ecological apparatus: Soil thermometer, Sling psychrometer, Abney's meter, Minimum and Maximum thermometer, Cup-anemometer, Flame photometer.
- Phytosociological study:
    a. Determine the minimum size of quadrate.
    b. Determine the minimum number of quadrate.
    c. Determine the quantitative characters of plant community by random quadrate method (Density, Abundance, Frequency and Basel cover).
    d. Preparation of frequency diagram of plant community.
    e. Evaluation of life form classes of local flora and preparation of Biological spectrum.
- Biomass and Productivity:
    a. Estimation of above and below ground biomass.
    b. Measurement of leaf area index.
- Soil analysis (Physical and Chemical characters):
    a. Determine the soil moisture content by oven drying method.
    b. Estimation of texture by soil sieve method.
- Determine the water holding capacity of different type of soil.
    a. Electro conductivity of soil.
    b. Calculation of phosphorus, potassium, Nitrogen and pH from the soil.
    c. Determine the Sodium, Potassium, Calcium and Phosphorus in plant/ash material.
- Water analysis (Physical and Chemical characters)
    a. Determine the Calcium, Chloride, Total Hardness and pH from water.
    b. Determine the Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) from water.

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BOC-304
PLANT PHYSIOLOGY
(Credit-4)

UNIT-I: Growth and Development

- Seed germination and seedling growth: Introduction, Physiological aspects of germination, mobilization of food reserve during germination, hormonal control, Seedling growth, Factors affecting seed germination.
- Latent Life Dormancy: Introduction to Seed dormancy, Types, Causes and overcoming of seed dormancy, factors affecting seed dormancy.
- Bud Dormancy: Introduction, causes and factors affecting bud dormancy.
- Senescence: Introduction, metabolic Changes associated with senescence and its regulation, Influence of Hormones and Environmental Factors on Senescence.

UNIT-II: Mineral Transport and Stress

- Membrane transport and translocation of water and solutes: Mechanism of water transport through xylem, root microbe interactions in facilitating nutrient uptake, Phloem loading and Unloading, Passive and active solute transport.
- Mechanism of absorption, regulation and transport of Macronutrients (K, P) and Micronutrients (Zn, Fe) in Plant.
- Stress physiology: Plant responses to biotic and abiotic stress, Physiological effects and mechanisms of abiotic stress tolerance.
- Water deficit and drought resistance, salinity stress, freezing and heat stress, oxidative stress.

UNIT-III: Photo-physiology

- Photosynthesis: General concepts and historical background, Photosynthetic Pigments systems and Light harvesting Complexes, Photo oxidation of water, Photophosphorylation and Mechanism of electron and proton transport and energy changes during light reaction.
- Carbon assimilation mechanism - The Calvin cycle / C3 Cycle, C4 Cycle, CAM Pathway, Photorespiration and its significance.
- Respiration: Overview of plant respiration, Glycolysis, the TCA cycle, electron-transport and ATP synthesis, Pentosephosphate pathway, Glycoxylate cycle.
- Sensory Photobiology: History and discovery of Phytochromes and Cryptochromes and their Photochemical and Biochemical Properties.

Unit: III

- Nitrogen fixation, nitrogen and sulphur metabolism: Overview, biological nitrogen fixation, nodule formation and non-factors, mechanism of nitrate uptake and reduction, ammonium assimilation, sulfate uptake, transport and assimilation.
- Plant growth regulators and elicitors: Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, hormone receptors, single transduction and gene expression.

Unit: IV - Plant hormones and flowering

- Plant Growth Regulators and Elicitors: Introduction, Types of hormones, natural and synthetic hormones, application of hormones.
- Structure, Physiological Effects and Mechanisms of Action of Auxins, Gibberellins, Cytokinins, Ethylene, Abscissic Acid. Physiological Effects and metabolism of Brassinosteroides, Polyamines.
- Hormone Receptors, Signal Transduction and Gene Expression.
- The Flowering Process: Photoperiodism, types and its significance, Floral Induction and Development, Vernalization.

Suggested readings:

- Buchanan B B, Gruisemm W, Jones R L (2015) Biochemistry and Molecular Biology of Plants, 2nd edition, Wiley Blackwell, NewJersey.
- Hopkins W G, Huner N P A (2009) Introduction to Plant Physiology, 4th edition Wiley International edition, JohnWiley & Sons, NewYork.
- Taiz L, Zeiger E, Moller I M, Murph A (2015) Plant Physiology and Development, 6th edition, Sinurer Associates Inc Publishers, Sunderland, Massachusetts.
- Frank B. Salisbury and Cleon W. Ross (1985) Plant Physiology Wadsworth Publishing Company, Belmont, California.
- Robert M. Devlin (3rd edition) (1975) Plant Physiology Van Nostrand Reinhold Company, NewYork.
- Walter Larcher (4th edition) (2003) Physiological Plant Ecology: Ecophysiology and Stress Physiology of Functional Groups Springer Verlag, Berlin.
- Hans Mohr and Peter Schopfer (2010) Plant Physiology Springer Verlag, Berlin. Edwin Oxlade (2007) Plant Physiology: The Structure of Plants Explained Glmp Ltd, Abergele, United Kingdom.

Laboratory Work Based on Topics Covered in BOC-304

Major Experiment:

1. Determination of IAA/ IAA Oxidase activity.
2. Estimation of Sugar, Protein, Amino acid content from control and stressed seeds.
3. Extraction and estimation of plant pigments in young and old leaves.
4. Estimation of chlorophyll a and b from C3 and C4 plants.

Minor Experiment:

1. Separation of Plant pigments by using separation funnel/Chromatography.
2. Seed germination under different light, temperature and hormone treatments.
3. Determination of seed survival under salinity.
4. Seed germination studies using different mineral ions.

General experiments:

1. Seed viability, seed vigor study and seed leach ate Study.
2. Study growth indices: RGR, NAR, LWR and LAL.
3. Effect of seed soaking with different PGRs on seed germination and seedling growth.
4. Demonstration of leaf senescence by ABA and Kinetin.

Demonstration:

1. Promotion and inhibition of seed germination as affected by red and Far- red radiation.
2. Avena Coleoptiles curvature test.
3. Effect of apical bud removal and auxins on lateral bud growth.
4. Translocation of floral hormone.
5. Corn leaf showing Kranz anatomy.
6. Clinostat apparatus.

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M.Sc. Semester–III

Botany Practical Examination, Nov./Dec.20

BOP-301: Botany Practical

(Based on Topics covered in BOC-301 & BOC-302)

[Biology and Diversity–III (Gymnosperms and Fossils, Molecular Biology of Plants]

Date: / /20_ Place:

Time: 5 Hours Maximum Marks: 75

Instruction: Students are requested to follow instructions given by the examiners

1. Identify and classify given specimens "A" and "B". **12**
2. Identify and describe with diagrams the structural peculiarities observed in the given specimens "C" and "D". **12**
3. Preparation of standard curve of DNA/ RNA or Analysis of DNA/ RNA by Agarose gel Electrophoresis. Tabulate your observation and draw graph. Show the result and/ or conclusion to the examiner. **12**
4. Separation and analysis of chloroplast protein/ mitochondrial protein/ Isolation of plant DNA/ Estimation of DNA/ RNA and show your preparation, Tabulate your observation and draw graph. Show the result and /or conclusion to the examiner. **12**
5. Comment upon the given spots/ Photographs /Diagrams /Models /Charts
   - F. From Molecular Biology **03**
   - G. From Molecular Biology **03**
   - H. From Fossils **03**
   - I. From Fossils **03**

6: **(A)** Journal **03**
(B) Submission **05**
(C) Viva-voce **07**

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M.Sc. Semester–III

Botany Practical Examination, Nov./Dec.20_

BOP-302:Botany Practical

(Based on Topics covered in BOC-303 & BOC-304)

[Plant Ecology, Plant Physiology]

Date: / /20 Place:

Time: 5 Hours Maximum Marks: 75

Instruction: Students are requested to follow instructions given by the examiners

Q.1: Determine the minimum size of Quadrate and then calculate the Frequency/Abundance/Density (Any five plant Species) from given area and show your observations and results to the examiner. 08

Q.2: Estimation of Calcium /Chloride /Total Hardness /Biological Oxygen Demand (BOD)/ Chemical Oxygen Demand (COD) from given water sample "**A**". 08

Q.3: Determine the Water holding capacity/ Moisture content/ Electrical Conductivity/ Phosphorus/Potassium/Nitrogen from given soil sample "**B**". 08

OR

Determine the Sodium, Potassium, Calcium and Phosphorus from plant ash material.

Q.4: Perform the Major experiment "**C**" assigned to You_____Tabulate your observations and draw graph. Show the result and/ or conclusion to the examiner. 12

Q.5: Perform the Minor experiment "**D**" assigned to You_____. Tabulate your observations. Show the result and/ or conclusion to the examiner. 10

Q.6: Perform the General experiment "**E**" assigned to You_____. Tabulate your observations. Show the result and/ or conclusion to the examiner. 08

Q.7: Comment upon the given spots/ Photographs/ Diagrams/ Models/ Charts

F. Demonstration 03
G. Demonstration 03

Q.8: (A) Journal 03
(B) Submission 05
(C) Viva-voce 07

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BOE-301
AIR POLLUTION AND CLIMATE CHANGE
(Credit-2)

UNIT-I

- Atmospheric composition and climate; gaseous and particulate pollutants, indoor air pollution.
- Sulphur derivatives: Sources, effects on plants and human health, mechanism of toxicity, resistance and buffering, sulphur metabolism.
- Nitrogen derivatives: Formation and sources; uptake, metabolism, critical load; effects on plants, eco systems and human health.
- Fluoride derivatives: Sources, bioaccumulation, effects on plants and human health.
- Tropospheric ozone: Formation, photochemical smog; effects on plants and human health, mechanism of toxicity, induction of defense system.

UNIT-II

- Stratospheric ozone depletion: Phenomenon, causes, effects of enhanced UV-Bon terrestrial plants, microbes, marine life and human health; mechanisms of action, evolution of land plants in relation to UV radiation.
- Climate change: Green house effects: process; drivers of climate change; consequences, global warming, sea level rise, agriculture, natural vegetation; human implications, effects of increased CO_2 on plants, carbon sequestration in terrestrial ecosystem.
- Acid rain: Formation, deposition, trends; consequences on soil fertility, aquatic and terrestrial ecosystems; forest decline.
- Biomonitoring of air pollution: Concept, active and passive monitoring; bioindicator parameter.

Suggested Readings:

1. Bell J N B, Treshow M (2002) Air Pollution and Plant Life, John Wiley and Sons Ltd, NewYork.
2. Omasa K, Nouchi I, DeKok L J (2005) Plant responses to air pollution and global change, Springer Japan, Tokyo.
3. Agrawal S B, Agrawal M (1999) Environmental Pollution and Plant Responses, CRC Press, BocaRaton, USA.
4. Gurjar B R, Molina T, Ojha CSP (2010) Air Pollution Health and Environmental Impacts, CRC Press, BocaRaton, USA.
5. Vallero D A (2007) Fundamentals of Air Pollution, Elsevier Academic Press, Amsterdam.
6. Rao M N, Rao H V N (2009) Air Pollution, Mc Graw-Hill Pub Co Ltd, NewDelhi.

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BOE-302
HERBAL MEDICINE
(Credit-2)

Unit-1

- Secondary metabolites: Introduction, its type and functions.
- Synthesis: Common pathway of biosynthesis of major secondary metabolites.
- Diagnostic features, bioactive molecules and therapeutic values of some common medicinal plants viz., Giloy, Brahmi, Safed musli, Amla, Kalmegh, Satavari, Bel, Sarpgandha, Ashwagandha, Aloe, Tulsi, Ashok.

Unit-2

- Multiplication and conservation of medicinal plants using in vivo & in vitro techniques.
- Nutraceuticals and medicinal foods.
- Bioprospecting, biopiracy and protection of traditional medicinal knowledge.
- Commercial cultivation of medicinal plants and Standardization of herbal drugs.

Suggested readings:

- Cultivation of Selected Medicinal Plants, National Medicinal Plant Board, 36, Janpath, NewDelhi.
- Mandal S C, Mandal V, Das A K (2015) Essentials of Botanical Extraction: Principles and Applications, Academic Press, Elsevier, Amsterdam.
- Prajati N D, Purohit S S (2006) A HandBook of Medicinal Plants, Agrobios, Jodhpur, India. Samant S S and Palini L M S (1998) Medicinal Plants of Himalaya: Diversity, Distribution and Potential Values, Gyonadra Prakashan, Nainital.
- Singh M P (2011) Indigenous Medicinal Plants, Social, Foresting and Tribals, Daya Publishing House, NewDelhi.

BOE-303

BIOSTATISTICS

(Credit-2)

Unit-1

- General concepts and terminology and Sampling methods.
- Concepts of central tendency, normal distribution and variability.
- Contingency tables and chi-square test.
- Comparison of means: t-test, multiple range tests.

Unit-2

- Correlation and regression analyses.
- Simple experimental design and analysis of variance.
- Introduction to multivariate methods: Parametric and non-parametric ordination.
- Statistical packages for data analyses.
- Basics of environmental modelling.

Suggested Readings:

- Forthofer RN, Sullee E, Hernandez M (2006) Biostatistics: A guide to design, analysis & discovery, Academic Press, USA.
- George W, Snedecor W, Cochran G (1989) Statistical Methods, Publisher Iowa State University Press, Ames, Iowa, USA.

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PATAN - 384 265

FACULTY OF SCIENCE

M.Sc. BOTANY

Semesters: IV

SYLLABUS

PROGRAM : HNGU 2059

Curriculum as per UGC Guideline

With Semester/CBCS/Grading Pattern

With effect from June - 2022 (and thereafter)

Submitted on
Date: 07/04/2021

TOTAL PAGE: 25

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Proposed Details of Course pattern and scheme of examination

Sem.	Course	Interaction (hrs/week)	Duration of Exam(hrs)	Marks			Credit
				Internal	External	Total	
Sem.-I	Core Paper-I	4	2.30	30	70	100	4
	Core Paper-II	4	2.30	30	70	100	4
	Core Paper-III	4	2.30	30	70	100	4
	Core paper-IV	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-I	2	2.00	15	35	50	2
	Practical (Based on core paper-I & II, III & IV)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-II	Core Paper-V	4	2.30	30	70	100	4
	Core paper-VI	4	2.30	30	70	100	4
	Core paper-VII	4	2.30	30	70	100	4
	Core Paper-VIII	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-II	2	2.00	15	35	50	2
	Practical (Based on core paper-V&VI,VII&VIII)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-III	Core Paper-IX	4	2.30	30	70	100	4
	Core paper-X	4	2.30	30	70	100	4
	Core paper-XI	4	2.30	30	70	100	4
	Core paper-XII	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-III	2	2.00	15	35	50	2
	Practical (Based on core paper-IX & X, XI & XII)	6	10(5X2days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
Sem.-IV	Core Paper-XIII	4	2.30	30	70	100	4
	Core Paper-XIV	4	2.30	30	70	100	4
	Core Paper-XV	4	2.30	30	70	100	4
	Core Paper-XVI	4	2.30	30	70	100	4
	Elective disciplinary/Interdisciplinary Paper-IV	2	2.00	15	35	50	2
	Practical (Based on core paper-)	6	10 (5X2 days)	-	150	150	6
	Total	**24**		**135**	**465**	**600**	**24**
OR							
Sem-IV	Core Paper-XIII	4	2.30	30	70	100	4
	Core Paper-XIV	4	2.30	30	70	100	4
	Core Paper-XV	4	2.30	30	70	100	4
	Minor Dissertation	12	10 (5X2 days)	-	300	300	12
	Total	**24**		**90**	**510**	**600**	**24**
OR							
Sem-IV	Major Dissertation	24	15 (5X3 days)	--	600	600	24
	Total	**24**			**600**	**600**	**24**

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Programme: M. Sc. BOTANY (CBCS)

Syllabus with effective from: June–2021

M. Sc. Botany				
Semester	**I**	**II**	**III**	**IV**
Core Paper-I (4Credits)	**Biology and Diversity-I** (Virus, Bacteria, Algae and Fungi) And Plant Pathology **(BOC-101)**	**Biology and Diversity-II** (Bryophytes, and Pteridophytes) **(BOC-201)**	**Biology and Diversity-III** (Gymnosperms and Fossils) **(BOC-301)**	**Plant Biotechnology (BOC-401)**
Core Paper-II (4Credits)	**Plant Taxonomy (BOC-102)**	**Plant Development and Reproduction (BOC-202)**	**Molecular Biology of Plants (BOC- 302)**	**Ethnobotany, Mushrooms and Mycorrhiza (BOC-402)**
Core Paper-III (4Credits)	**Cell Biology (BOC-103)**	**Biochemistry, Biophysics and Instrumentation (BOC-203)**	**Plant Ecology (BOC-303)**	**Plant Resources Utilization and Conservation (BOC-403)**
Core Paper-IV (4Credits)	**Genetics & Evolution (BOC-104)**	**Research methodology, Biostatistics, IPR and Biosafety (BOC-204)**	**Plant Physiology (BOC-304)**	**Horticulture and Plant Breeding (BOC-404)**
Elective-I (2 Credits) (Any One)	**Biofertilizer Technology (BOE-101)**	**Plant Tissue Culture (BOE-201)**	**Air Pollution and Climate Change (BOE-301)**	**Bioinstrumentation (BOE-401)**
	Environmental Biology (BOE-102)	**River Ecology and Water Management (BOE-202)**	**Herbal Medicine (BOE-302)**	**Conservation and Restoration Ecology (BOE-402)**
	Biodiversity (BOE-103)	**Bioinformatics (BOE-203)**	**Biostatistics (BOE-303)**	**Photobiology, Molecular Microbiology and Synthetic Biology (BOE-403)**
Core Practical - I (2 Credits)	**BOP-101 On the basis of BOC-101 & 102**	**BOP-201 On the basis of BOC-201&202**	**BOP-301 On the basis of BOC-301 & 302**	**BOP-401 On the basis of BOC-401 & 402**
Core Practical-II (2 Credits)	**BOP-102 On the basis of BOC-103 & 104**	**BOP-202 On the basis of BOC-203 & 204**	**BOP-302 On the basis of BOC- 303 & 304**	**BOP-402 On the basis of BOC-403 & 404**
				OR
				BOC-401, 402, 403 & Minor Dissertation
				OR
				Major Dissertation

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Detailed Course Pattern for Each Semester

M. Sc. Part-1: Semester - I

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-1	Core-I	2:30	70	30	100	4	4
Paper-2	Core-II	2:30	70	30	100	4	4
Paper-3	Core-III	2:30	70	30	100	4	4
Paper-4	Core-IV	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core-I & II)	Pract. -I	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core-III & IV)	Pract -II	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

M. Sc. Part-1: Semester – II

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-5	Core-V	2:30	70	30	100	4	4
Paper-6	Core-VI	2:30	70	30	100	4	4
Paper-7	Core-VII	2:30	70	30	100	4	4
Paper-8	Core-VIII	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core-V & VI)	Pract-III	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core-VII & VIII)	Pract-IV	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

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M. Sc. Part-2: Semester – III

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-9	Core-IX	2:30	70	30	100	4	4
Paper-10	Core-X	2:30	70	30	100	4	4
Paper-11	Core-XI	2:30	70	30	100	4	4
Paper-12	Core-XII	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core - IX & X)	Pract-V	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core - XI & XII)	Pract-VI	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

M. Sc. Part-2: Semester -IV

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-13	Core-XIII	2:30	70	30	100	4	4
Paper-14	Core-XIV	2:30	70	30	100	4	4
Paper-15	Core-XV	2:30	70	30	100	4	4
Paper-16	Core-XVI	2:30	70	30	100	4	4
Practical: Paper-1 (Based on Core - XIII & XIV)	Pract-VII	5:00	75	---	75	4	3
Practical: Paper-2 (Based on Core - XV & XVI)	Pract-VIII	5:00	75	---	75	4	3
Elective Course (Any One) Disciplinary / Interdisciplinary	Ele-	2:00	35	15	50	2	2
Total			**465**	**135**	**600**	**26**	**24**

OR

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Paper-13	Core-XIII	2:30	70	30	100	4	4
Paper-14	Core-XIV	2:30	70	30	100	4	4
Paper-15	Core-XV	2:30	70	30	100	4	4
Minor Dissertation	---	10 (5 X 2 Days)	300	---	300	12	12
Total	---		**510**	**90**	**600**	**24**	**24**

OR

Course	Name of the Course	Exam. Duration (Hours)	Ext. Marks	Int. Marks	Total Marks	Teaching Hours/ Week	Credit Point
Major Dissertation	---	15 (5 X 3 Days)	600	**---**	600	24	24
Total	---	**---**	**600**	---	**600**	**24**	**24**

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General format / design of core course
Question paper style / Pattern for Semester end examination

The semester- end examination question paper shall have following format:

Question paper will be set in the view of the / in accordance with the entire Syllabus and preferably covering each unit of the Syllabi.

Question-1(From Unit - 1)	**18 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following - Short Notes / Differences / Comparison (One out of two)	07 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks
Question – 2 (From Unit - 2)	**17 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following Short Notes / Differences / Comparison (One out of two)	06 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks
Question – 3 (From Unit - 3)	**18 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following - Short Notes / Differences / Comparison (One out of two)	07 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks
Question – 4 (From Unit - 4)	**17 marks**
(A) Answer the following – Long answer question (One out of two)	08 marks
(B) Answer the following Short Notes / Differences / Comparison (One out of two)	06 marks
(C) Answer the following – Objective type Question (Three out of Five)	03 marks

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General format / design of Elective course
Question paper style / Pattern for Semester end examination

The semester – end examination question paper shall have following format

Question paper will be set in the view of the / in accordance with the entire Syllabus and preferably covering each unit of the Syllabi

Question- 1 (From Unit - 1) **14 marks**

(A) Answer the following –Long answer question (One out of two) 08 marks

(B) Answer the following – Medium answer question (One out of two) 06 marks

Question – 2 (From Unit - 2) **14 marks**

(A) Answer the following – Long answer question (One out of two) 08 marks

(B) Answer the following – Medium answer question (One out of two) 06 marks

Question – 3 (From Unit -1 & 2) **07 marks**

Answer the following – Very short answer question (Seven out of ten)

(Unit wise five questions)

In One word, Fill in the gap, Objective type questions.

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CORE PAPERS

BOC-401 Plant Biotechnology

BOC-402 Ethnobotany, Mushrooms and Mycorrhiza

BOC-403 Plant Resources Utilization and Conservation

BOC-404 Horticulture and Plant Breeding

PRACTICAL PAPERS:

BOP-401 Practical Based on Topics Covered in BOC-401 & BOC-402

BOP-402 Practical Based on Topics Covered in BOC-403 &n BOC-404

ELECTIVE PAPERS:

Choice-based: Student should select any one course from the following.

BOE-401 Bioinstrumentation

BOE-402 Conservation and Restoration Ecology

BOE-403 Photobiology, Molecular Microbiology and Synthetic Biology

BOC-401
PLANT BIOTECHNOLOGY
(Credit-4)

UNIT-I

- Biotechnology - Basic concepts, principles and scope.
- Genetic Engineering of Plants: Aims, strategies for development of transgenics, Gene transfer methods, Vector mediated/indirect gene transfer (Agrobeacterium- the natural genetic engineer, T-DNA mediated gene tagging, Virus mediated gene transfer).
- Vector less\direct DNA transfer.
- Introduction to bioethics: Principles, Social, Ethical issues and Ethical conflicts in biotechnology.

Unit-II

- Microbial Genetic Manipulation: Bacterial transformation, selection of recombinants and transformants, genetic improvement of industrial microbes and nitrogen fixers, fermentation technology.
- Genetic Engineering of Plants: Aims, strategies for development of transgenes (with suitable examples),
- Molecular farming: Production of Antibodies, Vaccines, Polymers and Bioplastic.
- Genomes and comparative genomics- Molecular markers for introgression of useful traits. Brief account of Arabidopsis genomes and genome annotation.

Unit-III

- Transgenic plants for crop improvement in Wheat, Rice and resistance to herbicides, insecticides, virus and other diseases.
- Transformation of chloroplast (Cp) genome in higher plants (using micro injection & partical gun).
- Embryo culture, Bud culture, Pollen culture, Clonal propagation, Artificial seeds, Germ plasm storage, Cryopreservation.
- Production of hybrids and somatoclones, Production of secondary metabolites and natural products and application, Hybridoma technology.

Unit-IV

- Application of Biotechnology: In Horticulture, Floriculture & Agriculture, GMO crops and Traditional knowledge.
- Roll of Biotechnology: In Herbal medicine, Food nutrition and Health.
- Controlling environmental pollution and hazards, waste management by using biotechnology, social responsibility.
- Biotechnological Products: Industrial products and other related product for human welfare, biotechnology & sustainability.

Suggested Readings:

- Brown, T.A. (1999) Genomes, John Wiley and Sons (Asia) Pvt.Ltd., Singapore.
- Callow, J.A., Fort-Lloyd, B.V. and Newbury, H.J. (1997) Biotechnology and Plant Genetic Resources: Conservation and Use, CAB International, Oxon, UK.
- Chrispeels, M.J. and Sadava,(1994) Plants, Genes and Agriculture, Jones & Barlloy Publishers, Boston, USA.
- Glazer, A.N. and Nikaido (1995) Microbial Biotechnology. W.H. Freeman & Company, New York, USA.
- Gustafson, J.P (2000) Genomes Kluwer Academic Plenum Publishers, New York, USA.
- Henry, R.J (1997) Practical Applications of Plant Molecular Biology, Chapman & Hall London, UK.

Laboratory Work Based on Topics Covered in BOC-401

1. Models/Charts/Photographs of topic covered in theory syllabus.
2. Study of Embryo culture, bud culture, pollen culture.
3. Growth characteristics of E. coli using plating and turbidimetric methods.
4. Isolation of plasmid from *E.coli* by alkaline lysis method and its quantitation spectrophotometrically.
5. Restriction digestion of the plasmid and estimation of the size of various DNA fragment.
6. Cloning of DNA fragment in a plasmid vector, transformation of the given bacteria population and selection of recombinants.
7. Demonstration of DNA sequencing by Sanger's dideoxy method.

Suggested Readings (for laboratory exercise):

- Plant molecular biology Manual, 2nd edition, Kluwer Academic Publishers, Dordrecht, The Netherland.
- Glick, B.R. and Thompson, J.E(1993) Methods in Plant Molecular Biology and Biotechnology, CRS press, Boca Raton, Florida.
- Glover, D.M. and Hames, B.D. (Eds) (1995) DNA Cloning 1: A Practical Approach; Core Techniques, 2nd edition, PAS, IRL Press at Oxford University Press, Oxford.
- Hackett, P.B., Fuchs, J.W(1988) An introduction to Recombinant DNA Techniques; Basic Experiments in Gene manipulation. The Benjamin Cummings/ Publishing Co.; Inc Menlo, Calio Park, Callifornin.
- Shaw, C.H. (Ed.) (1988)Plant Molecule Biology: A Practical Approach, IRL Press, Oxford.

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BOC-402
ETHNOBOTANY, MUSHROOMS AND MYCORRHIZA
(Credit-4)

Unit-I:

- Ethnobotany: Introduction, concept, scope and objectives, Ethnobotany as an interdisciplinary science.
- Ethnic groups: Major and minor, Tribals of India and their life styles. Forest vs. ethnic groups, sacred grooves.
- Medico-ethnobotanical survey and their role in Ayurveda.
- Significance of the following plants in ethnomedicinal practices (along with their habitat and morphology) a) *Azadiractha indica* b) *Ocimum sanctum* c) *Vitex negundo* d) *Gloriosa superba* e) *Tribulus terrestris* f) *Pongamia pinnata* g) *Cassia auriculata* h) *Indigofera tinctoria*.

Unit-II:

- Methodology of Ethnobotanical studies: Field work, Herbarium, Ancient Literature, Archaeological findings, Protocols.
- Ethnobotany as a source (recent) of already known drugs: (a) *Withania* as an antioxidant and relaxant (b) *Rauvolfia* in brain ailments (c) *Becopa* and *Centella* in epilepsy and memory development in children (d) *Phyllanthus fraternus* in diabetic and viral jaundice (e) *Artemisia* as a powerful cerebral antimalarial agent and its possible use in tuberculosis.
- Role of ethnobotany in modern Medicine: Medico-ethnobotanical sources in India with special reference to Gujarat.
- The relevance of ethnobotany in the present context.

UNIT-III: Mushrooms

- Mushrooms: Basic Introduction, Types of Mushrooms: Oyster, white button, paddy straw, Morels, Truffles and poisonous mushrooms.
- Method of cultivation of *Agaricus bisporus*, scope and biological significance.
- Medicinal and nutritional value of Edible and Poisonous mushrooms.
- Effect of environmental, nutrient and chemical factors on mushroom formation.

UNIT-IV: Mycorrhizae

- Mycorrhizae: Basic introduction, types of Mycorrhiza: Endomycorrhizae and Ectomycorrhizae.
- Isolation and multiplication of mycorrhizae, VAM Fungi and orchid mycorrhizae.
- Role in crop productivity and forestry.
- Phosphate solubilizing fungi (PSF).

Suggested Readings:

- S.K. Jain (1995) Manual of Ethnobotany, Scientific Publishers, Jodhpur.
- S.K. Jain (ed.) (1981) Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi.
- S.K. Jain (ed.) (1989) Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
- S.K. Jain (1990) Contributions of Indian ethnobotany. Scientific publishers, Jodhpur.
- Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
- Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.
- Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
- Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.
- Vayas,S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming Akta Prakashan, Nadiad .
- Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster.
- Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
- Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.

Laboratory Work Based on Topics Covered in BOC-402

1. Live plants/Herbarium specimens/Photographs as per theory syllabus for description and identification.

2. Writing exercise.

3. Nomenclature exercise.

4. Classification exercise.

5. Visit the rural and forest area and identify the ethnobotanical important plants and its uses.

Mushrooms-

- To study on topics through chart/models/Photographs.
- Method of cultivation of *Agaricus bisporus* (edible mushroom), its biological significance.

Mycorrhizae-

- Isolation, identification and characterization of Mycorrhizae from local crop / forest /wild plant species.
- To study on topics through chart/models/Photographs.

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BOC-403

Plant Resources Utilization and Conservation

(Credit-4)

Unit-I: Plant Resources-I

- Adulteration in plant products: Introduction, detection of adulteration in the following: Oils- groundnut and sunflower, Spices and condiments: pepper, fennel, cardamom, saffron and clove, Cereals and pulses: Bajara, Rice, Tur and Gram.
- Origin, evolution, cultivation and uses of: (i) Food – Wheat, chicken pea, potato, Mustard (ii) Forage/fodder crops- bajara, guarbean.
- Plant fibers: Textile fibers- cotton, jute, linen, sun hemp, cannabis, Cordage (coir), Fibers for stuffing (silk cotton).

Unit-II: Plant Resources-II

- Dyes- Turmeric, Indigo, *Butea monosperma*, *Lawsonia alba*.
- Important fire wood and timber yielding plants: *Acacia nilotica*, *Tectona grandis*, *Dalbergia sissoo*, *Terminalia arjuna*, *Mangifera indica*.
- Rubber- Introduction, chemical composition, hevea rubber, Plantation and production of rubber in the world and India, Processing. Uses of rubber and synthetic rubber.
- Medicinal plants- *Atropa belladonna*, *Catheranthus roseus*, *Adhatoda vasica*, *Allium sativum*, *Phyllanthus emblica*, *Papaver somniferum*, *Aloe barbadense*.

Unit-III: Conservations-I

- Principles of conservations, Strategies for conservations - In situ conservation.
- International efforts and Indian initiatives, protected areas in India, Conservation of wild biodiversity: sanctuaries, national parks, biosphere reserves, Wetlands, Mangroves and coral reefs.

Unit-IV: Conservations-II

- Ex situ conservation: Principles and practices, botanical gardens, field gene bank, seed banks, *in vitro* repositories.
- General account of the activities of Botanical survey of India (BSI), National Bureau of plant genetic resources (NBPGR), Indian council of Agriculture research(ICAR), Council of scientific and Industrial research (CSIR), and the department of Biotechnology(DBT) for conservation and non formal conservation efforts.

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Suggested Reading:

- Paroda, R.S. and Arora R.K(1991) Plant resources conservation and management, IPGRIP USACampus, New Delhi.
- Chandel, K.P.S., Shukla, G. and Sharma, N (1996) Biodiversity in medicinal and aromatic plants in India, conservation and utilization. National bureau of plant genetic resources, New Delhi.
- Heywood, V.H. and Wyse Jakon, P.S (1991) Tropical botanical gardens, their role in conservation and development, Academic press San. Diego.
- Council of Scientific and Industrial Research (1986) The Useful Plants of India. Publications and directorate, CSIR, New Delhi.
- Kochhar, S L (1998) Economic botany of the Tropics, 2nd edition. Macmillan India Ltd., Delhi.
- Thakur, R.S., Puri, H.S. and Hussain, A (1989) Major Medicinal Plants of India. Central Institute of Medicinal and Aromatic Plants, CSIR, Lucknow.
- Swaminathan, M.S. and Kocchar, S.L (1989) Plants and Society. Macmillan Pub. London

Laboratory Work Based on Topics Covered in BOC-403

1. Perform the tests of adulteration in plant products: Oils-groundnut and sunflower, spices and condiments-pepper, fennel, cardemons, saffron and clove. Cereals and pulses- Bajara, Rice, Tur and Gram.
2. Scientific name, local name, family, useful organ, morphology and uses of food crops, forage/fodder crops, plant fibers, medicinal plants, dyes and important fire wood and timber yielding plants as per theory syllabus.
3. Visit to protected areas of India/Gujarat-sanctuaries, national parks, biosphere reserves, mangroves and coral reefs for conservation of wild diversity.
4. BSI, NBPGR, ICAR, CSIR, DBT and prepare the note.

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BOC-404
Horticulture and Plant Breeding
(Credit-4)

UNIT-I:

- Fundamentals of horticulture (History, nature and scope of horticulture)
- Origin of Horticulture: Domestication of plants, importance of horticulture in terms of economy, horticultural crops, pomology, olericulture, spices and planting,
- Ornamental horticulture: horticultural climatic zones of India and Gujarat, development of horticulture in India
- Divisions of horticulture, nutritive value and nutra-ceutical properties of horticultural crops.

Unit-II:

- Factors influencing horticultural crop production
- Growth and development: seed physiology; dormancy and germination, physiology of flowering, pollination, fruit set, fruit ripening and senescence.
- Factors influencing growth and development: soil, light, temperature, rainfall, humidity, wind.
- Role of plant growth regulators in seed and bud dormancy, juvenility, maturity and senescence, flowering, pollination, fruit set including parthenocarpy, fruit growth, fruit drop and fruit ripening (climacteric and non- climacteric) and fruit colour development, tuber and bulb formation and sex expression and extension of shelf life in fruits, vegetables and flowers.

Unit-III: Plant Breeding-I

- History, methods, goals, objectives and applications of plant breeding, Origin, domestication and introduction of crop plants.
- Modes of reproduction: asexual and sexual reproduction.
- Methods of plant breeding in Self and Cross Pollinated crops (pedigree method, bulk method, backcross method), merits and demerits of methods.
- Selection: pure line selection, mass selection, recurrent selection, population improvement, hybrid variety, synthetic variety.

Unit – IV: Plant Breeding-II

- Hybridization: History , techniques and consequences, objectives, types of hybridization – choice of parents, evaluation of parents, emasculation – different methods, bagging, tagging, pollination , harvesting and storing of the F1 seeds and selfing, consequences of hybridization, Hybrid vigour.
- Polyploidy in plant breeding: Application of polyploidy in crop improvement and its limitations.
- Basics of Genetically modified plants, Seed certification, Plant Breeder's Right, Biosafety and Bioethics.
- Intellectual Property Rights (IPR), Patents: Concept and Benefits.

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Suggested Readings:

- Adams, C.R. and M. P. Early(2004) Principles of horticulture. Butterworth – Heinemam, Oxford University Press.
- Chadha, K.L (2001) Handbook of Horticulture, ICAR, New Delhi.
- Chandra, R. and M. Mishra. (2003) Micropropagation of horticultural crops. International Book Distributing Co., Lucknow.
- Chattopadhyaya, P.K (2001) A text book on Pomology (Fundamentals of fruit growing) Kalyani Publication, New Delhi
- Christopher, E.P (2001) Introductory Horticulture, Biotech Books, New Delhi
- Edmond, J.B. T.L.Senn, F.S. Andrews and P.G.Halfacre (1975) Fundamentals of Horticulture, Tata MC. Graw Hill Publishing Co.New Delhi
- George Acquaah (2002) Horticulture-principles and practices. Prentice-Half of India pvt. Ltd., New Delhi.
- Hartman, H.T. and Kester, D.E (1986) Plant propagation – Principles and Practices – Prentice Hall of India Ltd., New Delhi.
- Jitendra Singh (2006) Basic Horticulture. Kalyani Publishers, New Delhi.
- Kumar, N (1997) Introduction to Horticulture, Rajalakshmi Publication, Nagercoil.
- Rajan, S. and B.L. Markose (2007) Propagation of horticultural crops. New India Publishing, New Delhi.
- Shanmugavelu, K.G., N. Kumar and K.V. Peter (2005) Production technology of spices and plantation crops. Agrobios, Jodhpur.
- Singh, N.P (2005) Basic concepts of fruit science. International Book Distributing Co., Lucknow.
- Surendra Prasad and U. Kumar (1999) Principles of horticulture, Agro-botanica, Bikaner, India.
- Teresa Andesirk, Gerald Audesirk and Bruce, E. Byers (2003) Biology-Life on Earth. 6th edition. Prentice Hall University of Massachusetts, Amherst.
- Valentine, D.H (1972)Taxonomy, Phytogeography and Evolution. Academic Press, London. New York.
- Webber, P and Punnett, N (1999) Physical geography and people Stanley. Thomas (Pub) Ltd. England.

Laboratory Work Based on Topics Covered in BOC-404

1. To detect the seed viability
2. Plant propagation by seeds and vegetative structures –tuber, rhizome, bulb, corn.
3. To study the seed germination in some selected plant species (Dicot & Monocot)
4. Perform the horticulture techniques-Stem cutting, Grafting, Budding, Layering, Potting and Repotting.
5. Landscaping-Principles, types and planning.
6. Greenhouse-Construction and maintenance techniques.
7. To prepare- organic farming, mulching and composting.
8. Indoor gardening- techniques and practice.
9. Old and new world polyploids variety (Wheat and Cotton).
10. Study through Charts/Photograph/Map.

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M. Sc. Semester – IV
Botany Practical Examination, 20….
BOP- 401: Botany Practical
(Based on Topics covered in BOC-401 & BOC-402)
[Plant Biotechnology and Ethnobotany, Mushrooms and Mycorrhiza]

Date : / / 20 Place :

Time : 5 Hours Maximum Marks : 75

Instruction: Students are requested to follow instructions given by the examiners

1. Write the short essay on Techniques/Vectors/Transgenic crops and show the results / conclusion to the examiner. 12

2. Perform the experiment on Embryo culture/Bud culture/Pollen culture, write media required and precautions. 12

3. Write critical notes on Ethnobotanical specimens of following. 12
   a. Herbarium Skill and Specimens/ Field work exercise/ Ancient literature.
   b. Ethno-medicinal uses of plant and practice.

4. Write critical notes on following. 12
   a. To study on topics through chart/models/Photographs: Mushrooms.
   b. To study on topics through chart/models/Photographs: Mycorrhiza.

5. Comment upon the given spots / Photographs / Diagrams / Models/ Charts 12
   a. From Plant Biotechnology
   b. From Ethnobotany
   c. From Mushrooms/ Mycorrhiza

6. a. Journal 03
   b. Submission 05
   c. viva-voce 07

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M. Sc. Semester – IV
Botany Practical Examination, 20….
BOP- 402: Botany Practical
(Based on Topics covered in BOC-403 & BOC-404)
[**Plant Resources Utilization and Conservation**, **Horticulture and Plant Breeding]**

Date : / / 20 Place :

Time : 5 Hours Maximum Marks : 75

Instruction: Students are requested to follow instructions given by the examiners

1. Mention any test of Adulteration in plant products, Show your preparation/results to examiner. 12

2. Scientific name, local name, family, useful organ, morphology and uses of natural resources A, B and C. 12

3. Write the principle, construction, types and maintenance of green house/landscaping/indoor gardening. Show your preparation/results to the examiner. 12

4. Describe the horticulture technique assigned to you. 06

5. Prepare the male and female flower through hybridization technique 06

6. Comment upon the given spots / Photographs / Diagrams / Models/ Charts: 12
   a. Mention the regions on the maps of world/India (From conservation-I).
   b. Write the brief summary on spot (From Conservation-II).
   c. Methods of Plant breeding (From Plant breeding-I).
   d. Old and new world Polyploid variety (From Plant breeding-II).

7. a. Journal 03
   b. Submission 05
   c. viva-voce 07

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BOE-401

Bioinstrumentation

Credits: 2

UNIT-I:

- Visualization techniques: Principle of working and applications of bright field microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, scanning and transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy.
- Principle and application of cytophotometry and flow cytometry.

Unit-II:

- Separation techniques: Basic principle and application of differential, density and ultracentrifugation.
- Principle and application of Native-PAGE, SDS-PAGE, Agarose and 2D gel electrophoresis, Capillary electrophoresis and its application.
- Principle, methodology and application of gel-filtration, ion-exchange and affinity chromatography, Thin layer and High performance Thin layer Chromatography. Gas chromatography. High performance liquid chromatography and FPLC.

Suggested readings:

- Sharma B.K.(2019) Instrumental method of chemical analysis
- Skoog D A (2007) Instrumental method of analysis
- Chatwal and Anand (2012) Instrumental Methods Of Chemical Analysis
- Boyer (2000) Modern experimental Biology

BOE-402

Conservation and Restoration Ecology

Credits: 2

UNIT-I:

- Introduction to conservation ecology: Principles, postulates and ethics
- Population dynamics and conservation: Genetic variation and its loss, .variation in natural populations, mechanisms of population regulation, habitat specific demography, population viability analysis.
- Species and habitat conservation: Prioritizing species and habitat, protected area networks, theory of reserve design.

UNIT-II:

- Conservation strategies: Planning and management, plan process for species and site management; general principles of management; models of sustainable development Ecology of disturbed ecosystems: Ecosystem dynamics and stability, disturbances, impact of disturbances on the structure and functioning of ecosystems.
- Aims and strategies of restoration: Concepts of restoration, ecosystem reconstruction, major tools used in restoration.
- Degradation and restoration of natural ecosystems.

Suggested readings:

- Wali MK (1992) Ecosystem Rehabilitation, SPB Academic Publishing, Amsterdam.
- Singh JS (1993) Restoration of degraded land: concepts & strategies, Rastogi Publications, Meerut.
- Pimm SL (1991) The Balance of Nature? Ecological Issues in the Conservation of Species and Communities, The University of Chicago Press, Chicago.
- Smith RL (2001) Ecology and Field Biology, 6th edition, Benjamin Cummings, San Francisco.
- Primack RB (2010) Essentials of Conservation Biology, 5th edition, Sinauer Associates Inc, Sunderland.
- Meffe GK, Carroll CR (2006) Principles of Conservation Biology, 3rd edition, Sinauer Associates Inc, Sunderland.

BOE-403

Photobiology, Molecular Microbiology and Synthetic Biology

Credits: 2

UNIT-I:

- Molecular mechanisms of photodamage and photoprotection: Photo-induced damage to microbes; genetical, biochemical and molecular aspects of mycosporine-like amino acids (MAAs) and scytonemin production, ecological and economical implications.
- Cyanobacterial toxins: Types of cyanobacterial toxins, molecular tools for the identification of toxic cyanobacteria, biochemical and molecular aspects of toxin production, ecological and economical implications.
- Light harvesting in cyanobacteria: Phycobilisomes, biochemical and molecular insight of light sensing and photomorphogenesis during complementary chromatic acclimation (CCA) in model organism Fremyella diplosiphon, ecological significance of CCA, model of CCA.
- Carbon concentrating mechanisms (CCM) in cyanobacteria: Components of CCM, types of carboxysome and its shell proteins, inorganic carbon uptake systems, carboxysomal enzymes, model of cyanobacterial CCM.

UNIT-II:

- Biofuels: Use of microalgae and cyanobacteria in renewable energy production, types of biofuel, cultivation systems, bioethanol production.
- Synthetic biology of cyanobacteria: Introduction of synthetic biology, Genetic modification of cyanobacteria, inducible promoters, reporters, application of cyanobacterial synthetic biology.
- Basics of antibody production: Steps involved in antibody production and purification, Innate and adaptive immune response, antigens, clonal selection theory, structure of antibody, primary and secondary antibody response, antigenic determinant (epitope), major histocompatibility complex (MHC), monoclonal and polyclonal antibodies, immunoprecipitation.

Suggested Readings:

- Herrero A, Flores E (2008) The Cyanobacteria: Molecular Biology, Genomics and Evolution, CaisterAcademic Press, Sevilla, Spain.
- Bryant DA (2004) The Molecular Biology of Cyanobacteria, Kluwer Academic Publishers, Berlin.
- Chorus I, Bartram J (1999) Toxic Cyanobacteria in Water: A guide to their public health consequences, monitoring and management, WHO, Berlin.
- Singh SK, Sundaram S, Kishor K (2014) Photosynthetic Microorganisms: Mechanism for Carbon Concentration, Springer Cham Heidelberg, New York.
- Karp G (2005) Cell and Molecular Biology, 4th edition, Willey International, New York. Tropp BE (2012) Molecular Biology 4th edition, Jones and Barlett Learning, USA.
- Bernard R, Glick, Jack JP (2003) Molecular Biotechnology: Principles and application of recombinant DNA, ASM Press, Washington, DC.

Hemchandracharya North Gujarat University

PATAN-384265

NAAC 'A' (3.02 C GPA) Accredited (State University)

U.G. (B. Sc.) Programme

CBCS :: Semester Grading Pattern

With Effect From
June- 2022 (In Continuation)

Faculty

SCIENCE

Subject

PHYSICS

SYLLABUS

PROGRAM CODE : HNGU1058

B.Sc. SEMESTER – V & VI

For Theory and Practical

Date : 14 /03/2022
Place : PATAN

Pri Dr J H Prajapati
CHAIRMAN
Board of Studies, PHYSICS

I/c. Registrar
Hemchandracharya
North Gujarat University
PATAN

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
Choice Based Credit System-Semester-Grading System
Under Graduate B Sc Programme
With Effective from June - 2022

The New course in B.Sc. PHYSICS (Sem-V & VI) UG syllabus (Programme) is based on Choice Based CreditSystem (CBCS) which is inforce from june-2022.

Salient Features of CBCS in UG programme:

1. Physics subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2022-23.
2. A student will have to get enrolled a **Core course** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting an **Elective** as well as **Foundation** courses from a pool of courses.
3. Each course shall be assigned a specific number of **Credits**.
4. A Core course is the course which should compulsorily be studied by a candidate as a Core requirement so as to get degree in a said discipline of study.
5. There shall be four **Core Compulsory** courses (Theory) each with **3 credits** and their practical's each with **1.5 credits**. Thus, a credit weight-age in Sem-V & VI of **B. Sc.** programme for each core course shall be of **4.5 credits**. In short, 4.5 credits multiplied by 4 core compulsory courses equal to total of **18 credits**.
6. In addition to the Core courses, a student will have to choose Elective as well as Foundation courses from a pool of courses.
7. **Two** courses of **Elective**, one each from **Generic Elective** and Interdisciplinary / Multidisciplinary **/ Subject centric electives** shall have to be offered. The credit weight-age for each Elective course shall be of **02 Credits**. Hence, a total credit weight-age for Elective courses shall be of **4 credits**.
8. One **Foundation** (English Language) course shall have to be offered. The credit weight-age for Foundation course shall be of **02 credits**.

Each course shall have a unique Course code. The Core courses, Elective courses and the Foundation courses shall be abbreviated respectively as **CC, PC, EG, ES and FC.**

1. Core Compulsory-**CC** Practical Core -**PC**
2. Elective Generic -**EG**
3. Elective Subject- **ES**
4. Foundation Compulsory- **FC**

Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to 90 working days. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.

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The course with **4 credits** shall be of **60 hrs**(15 weeks x 4 credits) duration. The course with **3 credits** shall be of **45 hrs**(15 weeks x 3 credits) duration. The course with **2 credits** shall be of **30 hrs**(15 weeks x 2 credits) duration.

A general framework for Bachelor of Science (B Sc) programme shall be as follows:

Semester wise credits						Toatal Creditsof the Programme
I	II	III	IV	V	VI	
24	24	24	24	24	24	144

The semester wise weightage of core, elective and foundation courses shall be as follows:

Academic Year	Core compulsory Courses	Elective courses	Foundation Courses
Semester I & II	75%	15-20%	10-15%
Semester III & IV	75%	15-20%	10-15%
Semester V & VI	75%	15-20%	10-15%

Total weight-age - 100%

Attendance:

The Attendance Rules as per the norms of Hemchandracharya North Gujarat University.

Medium of Instruction:

The Medium of Instruction shall be of **Gujarati medium**. Student is free to write answers either in **Gujarati** or **English** language.

Language of Question paper:

Question paper should be drawn in **Gujarati** language and its **English** version should be given.

Evaluation Methods:

1. A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**)/ (**Internal Evaluation**) as well as the **End of Semester examination** (**External Evaluation**). The weight-age of CCA shall be 30%, where as the weight-age of the Semester end examination shall be 70%. There will be **no internal evaluation in practical courses**.
2. The Semester assessment (**CCA**)/ (**Internal Evaluation**) is spread through the duration of the course and is to be done by the Teacher teaching the course. The assessment is to be done by various meansincluding:

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Internal Test-15 Marks Assignments –10 Marks Attendance -05 Marks

The performance of student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points. Evaluation for each course shall be done by continuous internal assessment as well as semester end exam and will be consolidated at the end of the course.

3. The **End of Semester examination** (**Theory Examination,External Evaluation**) shall have an assessment based upon following perspective with respect to all thecourses:

   - ✓ Evaluation with respect to Knowledge
   - ✓ Evaluation with respect to Understanding
   - ✓ Evaluation with respect to Skill
   - ✓ Evaluation with respect to Application
   - ✓ Higher Order Thinking Skills

4. With respect to all the above components, there shall be following types of Questions from each unit of the course.
   - ✓ Long answer questions
   - ✓ Medium answer questions
   - ✓ Short answer questions
   - ✓ Examples/ Problems,etc
   - ✓ MCQs/Fill in the blanks/ Match the pairs,etc.

Only Bord of Studies can change the Pattern of question paper of external examination.

5. The End of Semester Examination (Practical) will be conducted by the University. **A Certified Journal of the respective core compulsory course shall be produced at the time of practical examination. If a Student does not produce certified journal in the practical examination then examiner will be able to exclude him/her from practical examination.**

   In Practical Exam there will be four practicals (each from PC-501 to PC-504 for Sem-V & PC-601 to PC-604 for Sem-VI) each of 50 marks (35 Marks for practical+15 Marks for VIVA) and duration of each practical will be 3 hours. Numbers of student in a practical exam will be 16 per batch and examiners will be 2.

SCHEME OF ASSESMENT for Each Practical

No.	Name of the head	Marks
1.	Understanding and approach to the experiment, circuit layout, use of apparatus	10
2.	Tabulation with correct units and accuracy of reading, which is read and noted by the student and verified by examiner.	08
3.	Oral questions Regarding the experiment (Viva)	15
4.	Calculations by correct formula and graph with scale.	10
5.	Accuracy of the result as judged by comparing the students results with those supplied by expert assistant who has set the experiment.	02
6.	Marks for journal.	05
	Total	50

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6. It will be compulsory for a candidate to obtain passing percentage in both Internal as well as External Evaluation. The passing marks shall be **40%**, or as decided by concern Board of Studies of the Subject.
7. Promotion, Re-Admission and Time for Completion of Course, Procedure for Awarding Grades, Provision for Appeal, etc. as decided by the Hemchandracharya North Gujarat University.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS-Semester Grading Pattern

B.Sc. SEMESTER - V PHYSICS SYLLABUS

For Theory and Practical

From Academic year 2022-23

Unit	Physics Theory CC-PHY– 501 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY – 502 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY – 503 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY – 504 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3Hrs/Week	Elective Subject ES-PHY – 07 ES-PHY- 08 2Credit Total 50 Marks Internal 15 Marks External 35 Marks 2 Hrs/Week	Physics Practical PC:PHY-501 PC:PHY-502 PC:PHY-503 PC:PHY-504 6Credit Total 200 Marks (External) 12 Hrs/Week
I	Mathematical Physics	Statistical Mechanics	Nuclear Physics	Electronics	Student has to select one elective course from above two courses	There are Four Groups of Practicals. Each group Consists of 5 experiments. Total 20 experiments .
II	Classical Mechanics	Solid State Physics	Nuclear Physics	Electronics		
III	Quantum Mechanics	Plasma Physics	Molecular Spectra	Computer		

In order to give exposure of industry, research institute and higher learning in the field of physics, industrial visit may be arranged.

It is expected that students of B.Sc. (PHYSICS) Semester – V & VI must visit industry / research institute /institute of higher learning.

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B.Sc. SEMESTER - VI PHYSICS SYLLABUS
For Theory and Practical
From Academicyear2022-23

Unit	Physics Theory CC-PHY– 601 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY– 602 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY– 603 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY– 604 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Elective Subject ES-PHY – 09 ES-PHY- 10 2Credit Total 50 Marks Internal 15 Marks External 35 Marks 2 Hrs/Week	Physics Practical PC:PHY-601 PC:PHY-602 PC:PHY-603 PC:PHY-604 6Credit Total 200 Marks (External) 12 Hrs/Week
I	Mathematical Physics	Statistical Mechanics	Electrodynamics	Electronics	Student has to select one elective course from above two courses	There are Four Groups of Practicals. Each group Consists of 5 experiments. Total 20 experiments .
II	Classical Mechanics	Solid State Physics	Electrodynamics	Electronics		
III	Quantum Mechanics	Optics	Molecular Spectra	Computer Programming		

In order to give exposure of industry, research institute and higher learning in the field of physics, industrial visit may be arranged.

It is expected that students of B.Sc. (PHYSICS) Semester – V & VI must visit industry / research institute /institute of higher learning.

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B.Sc. Programme with 144 credits
CBCS-Semester-Grading Pattern w.e.f. June-2022

General Pattern/Scheme of study components along with credits for Science faculty.

SEMESTER	Course code	Study Components	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
B. Sc. Sem –V		**Semester-V**					
	CC:PHY-501	**Core Compulsory (CC) Course**					
	CC:PHY-502	Core Course-I (Paper-7)	3	30	70	100	3
	CC:PHY-503	Core Course-I (Paper-8)	3	30	70	100	3
	CC:PHY-504	Core Course-I(Paper-9)	3	30	70	100	3
		Core Course-I(Paper-10)	3	30	70	100	3
		Practical Core (PC) Course					
	PC:PHY-501	Practical Core Course-I (Paper-7)	3	--	50	50	1.5
	PC:PHY-502	Practical Core Course-I (Paper-8)	3	--	50	50	1.5
	PC:PHY-503	Practical Core Course-I(Paper-9)	3	--	50	50	1.5
	PC:PHY-504	Practical Core Course-I(Paper-10)	3	--	50	50	1.5
		Foundation Course (FC)					
	FC-5	Foundation (**Generic**) Course – V Compulsory English (L.L.)	2	15	35	100	2
		Elective Course (E)					
	EG-5	Elective (**Generic**) Course –V	2	15	35	50	2
	ES:PHY-07	Elective (**Subject**) Course –V	2	15	35	50	2
	ES:PHY-08		**30**	**165**	**585**	**800**	**24**
B. Sc. Sem-VI		**Semester-VI**					
		Core Compulsory (CC)Course					
	CC:PHY-601	Core Course-I (Paper-11)	3	30	70	100	3
	CC:PHY-602	Core Course-I (Paper-12)	3	30	70	100	3
	CC:PHY-603	Core Course-II (Paper-13)	3	30	70	100	3
	CC:PHY-604	Core Course-II (Paper-14)	3	30	70	100	3
		Practical Core (PC) Course					
	PC:PHY-601	Practical Core Course-I (Paper-11)	3	--	50	50	1.5
	PC:PHY-602	Practical Core Course-I (Paper-12)	3	--	50	50	1.5
	PC:PHY-603	Practical Core Course-II (Paper-13)	3	--	50	50	1.5
	PC:PHY-604	Practical Core Course-II (Paper-14)	3	--	50	50	1.5
		Foundation Course (FC)					
	FC-6	Foundation (**Generic**) Course – VI Compulsory English (L.L.)	2	15	35	100	2
	EG-6	**Elective Course (E)**					
	ES-PHY-09	Elective (**Generic**) Course –VI	2	15	35	50	2
	ES-PHY-10	Elective (**Subject**) Course –VI	2	15	35	50	2
			30	**165**	**585**	**800**	**24**

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B. Sc. Programme (CBCS-Semester-Grading pattern)
Semester end Examination (Sem-V & VI)
Format for Question paper for Elective Courses (Subject) in Physics

There will be three questions. First question will be from Unit - I, Second question from Unit-II, and Third question will be from both the Units. All the questions are detailed as under.

Time: 1.5 Hrs **Total Marks: 50**

1 (a) Answer the following (Any two out of three) 08 Marks
(Theory questions)
(b) Attempt any two of following (Out of three) 06 Marks
(Theory type **or** Application/Example/Problem)
(c) Attempt any three (Out of five) 06 Marks
(Short answer or objective type questions)

2 (a) Answer the following (Any two out of three) 08 Marks
(Theory questions)
(b) Attempt any two of following (Out of three) 06 Marks
(Theory type **or** Application/Example/Problem)
(c) Attempt any three (Out of five) 06 Marks
(Short answer or objective type questions)

3. Answer the following (Any ten out of twelve) 10 Marks
(M.C.Q. Type **or** objective type)

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B.Sc. Programme (CBCS-Semester Grading pattern) Semester end Examination (Sem-V & VI)

Format (Pattern) for Question paper of Core Compulsory Courses in Physics

There will be four questions. All questions are of 18,17,18& 17 marks each. First question will be from Unit - I, Second question from Unit-II, Third question from Unit-III, Forth question will be from all Three Units. Detailed about all the questions is as under.

Time: 2.5 Hrs **Total Marks: 70**

1	(a) Answer any one out of Two (Long Theory type questions)	08 Marks
	(b) Answer any Two Out of Three (Short Note/ Application/Example/Problem)	10 Marks
2	(a) Answer any one out of Two (Long Theory type questions)	07 Marks
	(b) Answer any Two (Out of Three) (Short Note/ Application/Example/Problem)	10 Marks
3	(a) Answer any one out of Two (Long Theory type questions)	08 Marks
	(b) Answer any Two (Out of Three) (Short Note/ Application/Example/Problem)	10 Marks
4	(a) Answer the following (Any Six out of Eight) (Short answer or objective type questions)	12 Marks
	(b) Answer the following (Any Five out of Seven) (Very Short answer or MCQ type questions)	05 Marks

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CBCS - Semester - Grading Pattern

B. Sc. Semester - V

PHYSICS SYLLABUS (Effective from June-2022)

CC: PHY-501

Mathematical Physics, Classical Mechanics & Quantum Mechanics

Course Objectives:

- To provide concepts of generalized curvilinear coordinates and their vector operators with orthogonal applications.
- To Give basic knowledge of Mathematical Physics and to Provide deep knowledge of various Differential equation for solving certain special classes of physical problems.
- To provide various numerical techniques useful for the scientific data analysis.
- To Understands the concept of Langrangian Formulation and properties of angular momentum and Eulers's equation of motion.
- To study the schrodinger equation, Degeneracy, Eigen value problem and Momentum eigen functions.

UNIT - I MATHEMATICAL PHYSICS

(a) Curvilinear Co-ordinates :

Curvilinear coordinates (10.6), Scale factors & basis factor for orthogonal systems (10.7), General Curvilinear coordinates (10.8), Vector operators in orthogonal Curvilinear Coordinates (10.9)

Note : The expressions for Divergence and curl are not to be derive but directly expressions are to be given.

Related Examples, Problems & Short Questions

Basic Reference: *Mathematical Methods in Physical Sciences 2nd Edition by M.L. Boas. John Wiley & Sons.*

(b) Differential Equations :

Some partial differential Equations Physics (2.1), The method of separation of variables (2.2A), Separation of Helmholtz equation in Cartesian Coordinates (2.2B), Separation of Helmholtz equation in spherical polar Coordinates (2.2C), Separation of Helmholtz equation in cylindrical coordinates(2.2D), Laplace's equation in various coordinate systems(2.2E), Choice of Coordinate system an seprability of a partial differential equation (2.3)

Related Examples, Problems & Short Questions

(c) Second order differential Equations :

Ordinary and singular points (3.1). Series solution around and ordinary point (3.2),

Some Special Functions in Physics : Laguerre Polynomials (5.7), The Gamma Functions (5.8)

Related Examples, Problems & Short Questions

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***Basic Reference** : Mathematical Physics by P. K. Chatopadhyay, New age international publsihers. (Second Edition). {For b & c}*

Other References:

1. Mathematical Physics by B.D.Gupta.
2. Mathematical Physics by H.K.Dass.

UNIT- II CLASSICAL MECHANICS

(a) Lagrangian Formulation :

Constraints (8.1), generalized coordinates (8.2), D'alembert's principle (8.3), Lagrange's equations (8.4), A general expression for kinetic energy (8.5), Symmetries and the laws of conservation (8.6), Cyclic or ignorable coordinates (8.7), Velocity dependent potential of electromagnatic field(8.8), Rayleigh"s Dissipation Function (8.9)

Related Examples, Problems & Short Questions

(b) Moving Coordinate Systems :

Coordinate Systems with relative translational motion (9.1), Rotating Coordinate systems(9.2), The Coriolis force (9.3), Motion on the earth (9.4), Effect of Coriolis force on a freely falling particle (9.5). ***Related Examples, Problems & Short Questions***

***Basic Reference:** Introduction to Classical Mechanics by Takawale and Puranik. McGraw Hill education (india) private limited.*

Other References :

1. Classical Mechanics, by Goldstein. Narosa Publishing House, NewDelhi.
2. Classical Mechanics by Yasvant Waghmare.
3. Classical Mechanics by N. C. Rana and P. S .Joag,THM

UNIT -III QUANTUM MECHANICS

(a) General formalism of Wave Mechanics :

The Schrodinger equation and Probability interaction for N-particle system (3.1), The fundamental postulates of wave mechanics (3.2), The Adjoint of an operator and self Adjointness, (3.3), The Eigen value Problem; Degeneracy (3.4), Eigenvalues and Eigen Functions of Self-Adjoint Operators (3.5), The Dirac Delta Function (3.6), Observables: Completeness and Normalization of Eigen Functions (3.7), Closure (3.8), Physical Interpretation of Eigen values, Eigenfunction and expansion Co-efficients (3.9), Momentum Eigenfunctions : wave Functions in Momentum Space (3.10), Uncertainly Principle (3.11), States with Minimum Value for Uncertainly Product (3.12), Commuting Observable: Removal of degeneracy (3.13). Evolution of System with Time Constants of the Motion (3.14). Non-Interacting and Interacting Systems. (3.15).

Related Examples, Problems & Short Questions

***Basic Reference** : A text book of Quantum Mechanics by P.M. Mathews and K. Venkateshan, McGraw Hill education (india) private limited.*

Other References :

1. Quantum Mechanics by Ghatak and Loknathan, The Macmillan company of India Ltd..
2. Quantum Mechanics by Fschwabi, Narosa Publishing House, New Delhi.
3. Quantum Mechanics by John, L. Powell and B.Crasemann.
4. Quantum Mechanics by Schiff.

Learning Outcome:

After the successful completion of the course students will be able to

- Understand the basic knowledge of generalized curvilinear coordinates and of various differential equations.
- Learnt the various numerical techniques useful for the scientific data analysis.
- Understand applications of various differential equations and solve certain special physical problems.
- Understand concept of Langrangian Formulation, properties of angular momentum and Euler's equation of motion.
- Get sufficient knowledge of Schrodinger equation, Degeneracy, Eigenvalue problem and Momentum eigen functions. Also knows about Physical interpretation of Eigen values, Eigen function.

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CBCS - Semester - Grading Pattern

B. Sc. Semester - V

PHYSICS SYLLABUS (Effective from June-2022)

CC: PHY-502

STATISTICAL MECHANICS, SOLID STATE PHYSICS & PLASMA PHYSICS

Course Objectives:

- To create awareness about various application of Statistical Mechanics, with knowledge of chemical potential as well as potential energy.
- To provide an exposure to Drude model, Sommarfeld model, Hall co-efficient.
- To create awareness about applications to plasmons, Polaritons and Polarons.
- To learn characteristics of plasma in magnetic field and get sufficient knowledge of various application of plasma. .

UNIT- I STATISTICAL MECHANICS

(a) Some Application of Statistical Mechanics:

Rotating Bodies (6.1), The Probability Distribution for Angular Momenta and Angular Velocities of Rotation of molecules (6.2), Thermodynamics (6.3), Reversible and Irreversible processes (6.3.1), The Laws of Thermodynamics (6.3.2) ((i) Zeros (ii) First Law (iii) Second Law (iv) Third Law), Statistical interpretation of the basics thermodynamic variables (6.4) & (6.4.1 to 6.4.8), Physical Interpretation of α (6.5), Chemical Potential in the equilibrium state (6.6), Thermodynamic functions in terms of grand partition function (6.7), Ideal gas (6.8), Gibbs's Paradox (Inclusive Sackur-Tetrode equation) (6.9), The Equipartition Theorem (6.10), The Statistics of Para magenetism (6.11), Potential Energy of a Magnetic Dipole in a Magnetic Field (6.11.1), Curle's Law (6.11.2), Thermal Disorder in a Crystal Lattice (6.12), Non-Ideal Gases (6.13).

Related Examples, Problems & Short Questions

Basic Reference : *Fundamentals of Statistical Mechanics by B. B. Laud. (Second edition) New Age International Publisher*

Other Reference:

1. Statistical Mechanics and Properties of Matter by E.S.R.Gopa
2. Statistical Mechanics by B K Agarwal & Melvin Eisner, Wiley Eastern
3. Statistical Mechanics - Theory and Application by S K Sinha, TMHPub Co.Ltd. New Delhi
4. Statistical Mechanics by R K Pathariya, Pegramon Press

UNIT-II SOLID STATE PHYSICS

(a) Free Electron Theory of Metals:

The Drude Model (6.1), Electrical Conductivity of Metals (6.1.1), Thermal Conductivity of Metals (6.1.2), Lorentz Modification of the Drude Model (6.2), The Fermy-Dirac (F.D.) Distribution Function (6.3), The Sommerfeld Model (6.4), Density of States(6.4.1), The Free Electron Gas at 0° K (6.4.2), Energy Of Electron at 0° K (6.4.3), The Electron Heat Capacity (6.5), The Sommerfeld Theory of Conduction in Metals (6.6), The Hall Co-efficient(R_H) (6.6.1).Mathiessen's Rule (6.7).

Related Examples, Problems & Short Questions

(b) Application to Plasmons, Polaritons and Polarons:

(Note: Qualitative description of dielectric constant $\epsilon(W)$ should be given equation 10.45 and 10.49)

Dielectric Losses (10.6), Optical Phenomena (10.7), Application to Plasma(10.8), Plasma Ossilations(10.8.1), Transeverse Optical Mode in Plasma(10.8.2), Application to Optical Phonon Modes in Ionic Crystals(10.9), The Longitudinal Optical Mode(10.9.1), Transeverse Optical Mode(10.9.2), The Interaction of Electromagnetic Waves with Optical Modes(10.10), Application to the Motion of Electrons in Polar Crystals (10.11).

Basic Reference: *Elements of Solid State Physics by J.P. Srivastava, PHI New Delhi 2006 (Second Edition)*

Other References :

1. Solid State Physics by A. J. Dekker.
2. Introduction to Solid State Physics by C. Kittel. 7th Edition, John Willy and Sons
3. Solid State Physics by S O Pillai (8th Edition), New Age Int. Publishers Limited
4. Fundamental of Solid State Physics by Saxena, Gupta, Saxena & Mandal, Pragati Prakashan

UNIT- III PLASMA PHYSICS

(a) Characteristics of a Plasma in a Magnetic Field:

Description of Plasma as a Gas Mixture (3.1), Properties of Plasma in Magnetic Field (3.2), Force on Plasma in Magnetic Field (3.3), Current in Magnetised Plasma (3.4), Diffusion in a Magnetic Field (3.5), Collisions in Fully Ionized Magneto-Plasma (3.6), Pinch Effect (3.7), Oscillations and Waves in The Plasma (3.8), Plasma Frequency (3.8.1), Maxwell's Equation in a Homogenous Plasma (3.8.2), Electromagnetic or Transeverse Oscillations (Steady Applied Magnetic Field $\overrightarrow{B_a}$=0) (3.8.3), Electrostatic or Longitudinal Oscillations ($\overrightarrow{B_a}$=0) (3.8.4), Oscillations of the Plasma ($\overrightarrow{B_a}\neq$0) (3.8.5), Hydromagnetic Waves (3.8.6), Resonances and Cut-offs or Reflection Points(3.8.7)

Related Examples, Problems & Short Questions

(b) Applications of Plasma:

Controlled Thermonuclear Reactions (7.1), Lawson Criterion (7.1.1), The Coulumb Barrier (7.1.2), Heating and Confinment of the Plasma (A) - Pinch Devices: Z-Pinch and θ- pinch, (B)- Mirror

Machine, (C)- Stellarator, (D)- Tokamak, (E)- levitrone, (7.1.3), Radiation loss of energy (7.1.4), Magneto Hydrodynamic conversion of energy (7.2), Plasma Propulsion (7.3), Other plasma devices (7.4).

Basic Reference: *Elements of Plasma Physics by S. N. Goswami New Central Book Agency (P). Ltd. Calcutta.reprint2011.*

Other References :

1. Introduction to Plasma Physics by F.F.Chen. PlenumPress.
2. Plasma Physics by S. N. Sen, Pragati Prakashan, Meerut.

Learning Outcome:

At the successful completion of the course, the students will be able to understands

- Various application of Statistical Mechanics and sufficient knowledge of chemical potential as well as potential energy.
- Also earn sufficient knowledge about Thermodynamic functions in terms of grand partition function, Ideal gas, Gibbs's Paradox and The Equipartition Theorem.
- Drude model, Sommarfeld model, Hall co-efficient. Also aware about applications to plasmons, Polaritons and Polarons.
- Characteristics of plasma in magnetic field and get sufficient knowledge of various application of plasma.
- Plasma frequency, Oscillations of plasma, electromagnetic (Transeverse) oscillations

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B. Sc. Semester-V

PHYSICS SYLLABUS (Effective from June-2022)

CC: PHY-503

NUCLEAR PHYSICS & MOLECULAR SPECTRA

Course Objectives:

- To make students aware of properties of Nucleus and also familiarize and acquaint Rutherford scattering as well as estimation of Nuclear size.
- To learn different types of spectra and decay of alpha, Beta and Gamaa rays.
- To provide an exposure to Liquid drop model of a nucleus, Nuclear Energy and various Elementary particles
- To learn characteristics of Types of Molecular Energy and Molecular Spectra
- To get sufficient knowledge of Rotational Spectra and Salient Features of Vibrational-Rotational Spectra

UNIT - I NUCLEAR PHYSICS : THE NUCLEUS

(a) Part – I Constituents of the Nucles and Some of Their Properties

Introduction (4.I.1), Rutherford Scattering and Estimation of the Nuclear Size (4.I.2), Measurement of Nuclear Radius (4.I.3), Constituents of the Nucleus and their Properties.(4.I.4).

Part – II Alpha Rays : Spectra and Decay

Range of Alpha Particles (4.II.1), Disintegration energy of Spontaneous Alpha-Decay (4.II.2), Alpha-Decay Paradox-Barrier Penetration(4.II.3).

(b) Part – III Beta Rays : Spectra and Decay

Introduction (4.III.1), Continuous Beta ray spectrum-Difficulties in understanding it (4.III.2), Pauli's Neutrino Hypothesis (4.III.3), Fermi's theory of Beta-dacay (4.III.4), The Detection of Neutrino (4.III.5).

Part – IV Introduction of Gamma(γ) Emission:

Introduction (4.IV.1), Gamma(γ)-ray emission - selection rules (4.IV.2), Internal conversion (4.IV.3). Nuclear Isomerism (4.IV.4).

Related Examples, Problems & Short Questions

Basic Reference :

Nuclear Physics (An Introduction) by S. B. Patel, New age international publishers (second Edition)

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Other References :

1. Nuclear Physics by D C Tayal, Himalaya Publishers.
2. Nuclear Physics by Irvin Kaplan
3. Introduction to Nuclear Physics by H Henge, Addition Wesley.

UNIT-II NUCLEAR PHYSICS

(a) The Liquid drop model of a nucleus

Introduction (5.1), Binding Energies of Nuclei: Plot of B/A Against A (5.2), Weizsacher's Semi-Empirical Mass Formula (5.3), Mass Parabolas: Prediction of Stability Against β - Decay for Members of an Isobaric Family (5.4)

(b) Nuclear Energy

Introduction (6.1), Neutron Induced Fission (6.2), Asymmetrical Fission-Mass Yield (6.3), Emission of Delayed Neutrons by Fission Fragments(6.4), Energy Released in the Fission of ^{235}U (6.5), Fission of Lighter Nuclei (6.6), Fission Chain Reaction (6.7), neutron cycle in a Thermal Nuclear Reactor (6.8), Nuclear Reactors (6.9)

Related Examples, Problems & Short Questions

Basic Reference :

Nuclear Physics An Introduction by S. B. Patel, Willey Eastern Ltd. ***{For a and b}***

(c) Elementary Particles:

Interaction and Particles (13.1), Leptons and Hadrons (13.1.1), Leptons (13.2), Neutrino and Antineutrino (13.2.1), Other Leptons (13.2.3), Hadrons (13.3), Quarks (13.5)

Basic Reference :

Concepts of Modern Physics by Arthur Beiser, S. Mahajan, S R Choudhury ***{For c}*** (Seventh Edition) McGraw Hill Education

Other References :

1. Nuclear Physicsby D C Tayal, Himalaya Publishers.
2. Nuclear Physics by Irvin Kaplan
3. Introduction to Nuclear Physicsby H Henge, Addition Wesley.

UNIT-III MOLECULAR SPECTRA

(a) Types of Molecular Energy and Molecular Spectra :

Separation of Electronic and Nuclear Motion: the Born Oppenheimer Approximation (17.1), Types of Molecular Spectra (17.2), Types of Molecular Energy States and Associated Spectra(17.3)

(b) Pure Rotational Spectra :

Salient Features of Rotational Spectra (18.1), Molecular Requirement for Rotational Spectra (18.2), Experimental Arrangement (18.3), The Molecule as a rigid Rotator: Explanation of

Rotational Spectra (18.4), The Non-rigid Rotator (18.5), The Isotope Effect (18.6).

(c) Vibrational – Rotational Spectra :

Salient Features of Vibrational-Rotational Spectra (19.1), The Molecule as a Harmonic Oscillator (19.2), Anharmonic Oscillator (19.3), Vibrational Frequency and Force Constant for Anharmonic Oscillator (19.4), Isotope effect on Vibrational Levels(19.5)

Related Examples, Problems & Short Questions

Basic Reference: *Atomic & Molecular-Spectra by RajKumar, KedarNathRamNath, Delhi.*

Other References:

1. Molecular spectroscopy by Herz-Berg.
2. Molecular spectroscopy by Banewell
3. Atomic Physics by J B Rajam (7th Edition) S. Chand publication, Delhi
4. Elements of spectroscopy by S L Gupta, V Kumar, R C Sharma, (30th Edition) Pragati Prakashan

Learning Outcome:

At the successful completion of the course, the students will be able to understands

- Properties of Nulceus also Rutherford scattering as well as estimation of Nuclear size.
- Different types of spectra and decay of alpha, Beta and Gamaa rays.
- Liquid drop model, Nuclear Energy and Fission of Lighter Nuclei and Fission Chain Reaction
- Various Elementary particles like Leptons Hadrons, Neutrions, Antineutrions, Hadrons and Quarks
- Characteristics of Molecular Energy and Molecular Spectra
- Rotational Spectra and Salient Features of Vibrational-Rotational Spectra and applications

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc.Semester-V

PHYSICS SYLLABUS (Effective From June-2022)

CC: PHY-504
ELECTRONICS & COMPUTER

Course Objectives:

- To provide deep knowledge of Network Transmission and various type of network sections.
- To make students aware about Thyristor and Optoelctric Devices like Triac, Diac, LDR, Solar cell. To learn applications of LDR, Characteristics of Solar cell and of LASER.
- To get sufficient knowledge of basic Transistor amplifier, Multistage amplifier and Regulated power supply.
- To learn about computer, executing a C Program and programming style.
- To provide an exposure to programming C.

UNIT – I

(a) Network Transformations:

Principle of duality (1.3), Reduction of Complicated network (1.4), Conversions between T and π sections (1.5), The bridged-T network (1.6), The Lattice Network (1.7), The Reciprocity theorem (1.9), The compensation theorem (1.12), Driving point impedance, transfer impedance (1.14), The parallel-T network (1.17).

Basic Reference *: Networks, Lines and Fields by J. D. Ryder Prentice Hall.*

(b) Thyristors and Optoelectronic Devices :

Introduction to Thyristors, Triac (2.51), Diac (2.52),
Introduction to Optoelectronic Devices (3.1), LDR (Light Dependent Resistor) or Photo-Conductive Cell (3.2), Applications of LDR (3.3), Photo-Transistor (3.5), Photovoltaic or Solar Cells: construction, working, Characteristic and Efficiency of Solar cell(3.6), Lasers (3.8), Laser Action (3.9), Spontaneous and Stimulated Emission Probabilities and Condition of Population Inversion (3.10), P-N Junction Laser Diode (3.11).

Related Examples, Problems & Short Questions

Basic Reference *:Hand Book of Electronics by Gupta and Kumar, 46th revised Edition 2019.*

UNIT - II

(a) Basic Transistor Amplifiers:

Current and Voltage amplifiers (6,10), Common Emitter Amplifiers with Emitter Resistor (6.11), Simplified Common Emitter Hybrid Model (6.12), (6.12.1, 6.12.2), Effect of An Emitter Bypass Capacitor in low frequency Response (6.13)

(b) Multistage Amplifiers :

Multistage Transistor Amplifiers (General) (7.1), Terms used in Multistage Transistor Amplifiers (7.1.1), R-C- coupled Amplifiers (7.2), Middle Frequency Range (7.2a), Low Frequency Range and Lower Cut-off Frequency (7.2b) Transformer Coupled Amplifiers (7.4, a, b), Direct coupled Amplifiers (7.5), Effect of cascading on Band width (7.6).

Related Examples, Problems & Short Questions

Basic Reference : *Hand Book of Electronics by Gupta and Kumar. 46th revised Edition 2019.*

UNIT - III

(a) Overview of C :

History of C (1.1), Importance of C (1.2), Sample Program: Printing a Message (1.3), Basic Structure of C Programs (1.8), Programming Style (1.9), Executing a C Program (1.10).

(b) Constants, Variables & Data Types: (**Programming in C**)

Introduction (2.1), Character Set (2.2), C Tokens (2.3), Keywords and Identifiers (2.4), Constants (2.5), Variables (2.6), Data Types (2.7), Declaration of Variables (2.8), Declaration of Storage Class (2.9), Assigning Values of Variables (2.10), Defining Symbolic Constants (2.11), Declaring a Variable as Constant (2.12), Declaring a Variable as Volatile (2.13), Overflow and Underflow of Data (2.14).

Basic Reference : *Programming in ANSI C by E.Balaguruswami (THM) (3rd Edition)*

(c) Regulated dc power supply

Introduction to regulated power supply, Transistor Series voltage Regulator (25.2.), Negative Feedback Voltage Regulator (25.3), Transistor Shunt Regulator (25.4), Transistor Current Regulator (25.5),

Related Examples, Problems & Short Questions

Basic Reference :

Electronics and Radio Engineering by M. L. Gupta. 9th Enlarged Edition reprint 2002. Dhanpat Rai Publication Co.

Other Reference :

1. Electronic Devices and Circuits by Mottershead Prentice Hall
2. Integrated Electronics by Millimum & Halkias
3. Basic Electronics and Linear Circuits by N N Bhargava, D C Kulshreshtha, S C gupta

Learning Outcome:

At the successful completion of the course, the students will be able to understands

- The Network Transmission and various type of network sections like T and π sections, the bridged -T network and the Lattice Network.
- Triac, Diac, LDR, Solar cell. To learn applications of LDR, Characteristics of Solar cell and of LASER.
- Basic Current and Voltage amplifiers, Common Emitter Amplifiers with Emitter Resistor and Simplified Common Emitter Hybrid Model. Also Multistage amplifier (R-C- coupled Amplifiers) and Regulated power supply.
- About computer, executing a C Program, programming style and programming C.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-V

PHYSICS SYLLABUS (Effective From June-2022)

LABORATORY EXPERIMENTS

Course Objectives:

- To gain practical knowledge by applying the experimental method to correlate with the Physics theory.
- To provide hands on experience with equipments such as CRO, GM counter, spectrometer, Goniometer, electronic circuits.
- To learn the usage of electrical and optical systems of various measurements.
- To impart practical knowledge by performing experiments based on the principles of theory courses.
- To provide training how to analyze the experimental data and graphical analysis.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in the group.

PC: PHY-501

1. Acceleration due to gravity (g) using Kater's pendulum(with **MOVABLE** knife edges)
2. Determination of Thermal conductivity 'K' of a rubber tube.
3. I-V Characteristic of solar cell and determination of FF, V. F.& η
4. Velocity of sound in air using CRO
5. G.M. Counter (Plateau Characteristics)

PC: PHY-502

1. Refractive index ' μ ' by total internal Reflection method using Gauss eyepiece
2. Resolving power of grating
3. To study absorption spectra of Iodine gas molecule
4. Goniometer (Determine of Cardinal points)
5. To study absorption spectra of liquid($KMnO_4$)

PC: PHY-503

1. Comparison of capacity (C_1/C_2) using method of mixture
2. Measurement of frequency f and phase difference 'θ' of a.c wave using CRO
3. Calibration of magnetic field
4. Solenoid Inductor (Fixed Current of Secondary Coil)
5. e/m Thomson method

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PC: PHY-504

1. A study of transistorized Hartley Oscillator using CRO/Wavemeter
2. I/P and O/P impedance of a R-C CE amplifier at different frequency using VTVM/CRO
3. A study of Transformer coupled Amplifier using VTVM/CRO
   (voltage gain frequency response and bandwidth)
4. Diac characteristics
5. Characteristic of SCR

Learning Outcomes:

By the end of the course, the students will be able to understand..

- The basic principles of Physics related to their courses in the practical way.
- The operational details of CRO, GM counter, spectrometer, electronic circuits etc.
- The experimental design aspects to determine various properties of like gravity, Thermal conductivity, Refractive index, determination of R, analysis of absorption spectra, value of e/m etc.
- The process to analyze the observations and infer the outcome of the experiments.
- How to analyze the experimental data and graphical analysis.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

Elective (Subject) Courses for SEM V [Credits-2]

(In force from June 2022)

ES : PHY-07: INSTRUMENTS

Course Objectives:

- To gain deep knowledge of principle, construction, working process of M I.
- To provide hands on experimental aspect to measurement of wavelength and determination of thickness of thin transparent sheet as well as refractive index.
- To develop knowledge of B.C. as well as CRO and usage of it.
- To learn the usage of GM counter and working function of it.

UNIT I

Michelson's Interferometer (15.7) Principle, Construction, Working, Circular fringes, Localized fringes, White light fringes, Visibility of fringes(15.7.1 to 15.7.7), Applications of Michelson Interferometer (15.8)-Measurement of wavelength, Determination of difference in the wavelengths of two waves, Thickness of a thin transparent sheet, Determination of the refractive index (15.8.1 to 15.8.4)

Babinet Compensator (20.21):Construction (20.21.1), Production of polarized light (20.21.2), analysis of elliptically polarized light (20.21.3).

UNIT-II

C.R.O.: CR Tube (3.5), Electrostatic Deflection Sensitivity (3.5.1), Magnetic Deflection Sensitivity (3.5.2), CRT connections (3.5.3), Uses of C.R.O.(3.5.4)

G. M. Counter: Principle, Construction, Working, Dead time, recovery time, True counting rate, Efficiency of counting, Quenching of G M counter, Operation and testing of G.M. counter, Plateau, Applications of GMC, Advantages and limitations of GMC.

Basic references:

1. A Textbook of Optics by Dr. N. Subrahmanyam, Brijlal & Dr.M. N.Avadhanulu, S.Chand (for M.I, B.C.)
2. Hand Book of Electronics by Gupta and Kumar. 30th revised Edition 2002.(for CRO)
3. Refresher Course in Physics Vol-III, S. Chand & Co. Ltd.(7th edition-2006) (for GMC,Ch-28)

Learning Outcomes:

By the end of the course, the students will be able to understand..

- Principle, construction, working process of M I.
- The technique of measurement of wavelength and determination of thickness of thin transparent sheet as well as refractive index.
- The principle, working function and usage of B.C. as well as CRO.
- The usage of GM counter and working function of it.

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CBCS - Semester - Grading Pattern
B. Sc. :: PHYSICS :: SEMESTER-V

ES : PHY-08: ENERGY TECHNOLOGY

Course Objectives:

- To gain deep knowledge of Fundamentals and Applications of Solar Energy.
- To learn the Merits and Limitations of Solar energy conversion and utilization.
- To develop knowledge of Solar energy from satellite station through microwaves to Earth station.
- To provide an exposure to Solar photovoltaic systems: V-I characteristics of a solar cell.

UNIT – I

Fundamentals and Applications of Solar Energy

Introduction (3.1), Applications (3.2), Essential subsystems in a Solar energy plant (3.3), Solar energy chains (routes) and their prospects (3.4), Terms and definitions of some basic entities (3.4.a.), Units of solar power and solar energy (3.5). Merits and Limitations of Solar energy conversion and utilization (3.6), .Energy from the Sun (3.10), Solar constant (3.11).

UNIT- II

Solar Energy Conversion Systems and Thermal Power Plants:

Solar thermal power supply system for space station (4.18), Solar energy from satellite station through microwaves to Earth station (4.19), Solar thermoelectric power (4.20). Solar photovoltaic systems: V-I characteristics of a solar cell (5.6), Inter connections of solar cell (5.7), Efficiency of solar cell (5.8).

Basic Reference:

Energy Technology by S. Rao and Dr. B. B. Parulekar. Khanna Publ., Delhi. 1st edition 1985

Learning Outcomes:

By the end of the course, the students will be able to understand.

- The fundamentals and Applications of Solar Energy.
- Merits and Limitations of Solar energy conversion and utilization.
- The Solar energy from satellite station through microwaves to Earth station.
- The Solar photovoltaic systems and V-I characteristics

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હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

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પરિપત્ર ક્રમાંક – ૧૩૦ / ૨૦૨૨

વિષયઃ વિજ્ઞાન વિદ્યાશાખાના સ્નાતક કક્ષાના નવા અભ્યાસક્રમો અંગે...

આ યુનિવર્સિટી સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાએ કરેલ ભલામણ અનુસાર નીચેના વિષયોના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો **જૂન – ૨૦૨૨ થી ક્રમશઃ અમલ માં આવે તે રીતે** એકેડેમિક કાઉન્સિલએ તેની તા. ૧૨/૦૪/૨૦૨૨ ની સભા ના નિર્દિષ્ટ ઠરાવો થી મંજૂર કરેલ છે. જેનો અમલ કરવા સારૂ સંબંધિતોને આ સાથે મોકલવામાં આવે છે, જેનો ચુસ્ત અમલ થવા વિનંતી છે.

ક્રમનં.	અભ્યાસક્રમ	એકેડેમિક સભાના ઠરાવક્રમાંક	સેમેસ્ટર
૧	વનસ્પતિશાસ્ત્ર	૨૪	સેમ.–૫ અને ૬
૨	ગણિતશાસ્ત્ર	૨૬	સેમ.–૫ અને ૬
૩	ભૌતિકશાસ્ત્ર	૩૦	સેમ.–૫ અને ૬
૪	રસાયણશાસ્ત્ર	૫૩	સેમ.–૫ અને ૬

આ બાબતની સંબંધિત અધ્યાપકો તથા વિદ્યાર્થીઓને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

નોંધઃ (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજ ના ગ્રંથાલયમાં મૂકવાની રહેશે.
(૨) આ અભ્યાસક્રમ યુનિવર્સિટીની વેબ સાઈટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

સહી/–
અધ્યક્ષ
કા.કુલસચિવ

બિડાણઃ ઉપર મુજબ

નં.–એ કે / અ× સ / ૧૧૭૫ / ૨૦૨૧
તારીખ : ૦૧ / ૦૬ / ૨૦૨૨

પ્રતિ,

૧. અધ્યક્ષશ્રી/ કો.ઓર્ડીનેટરશ્રી –વિજ્ઞાન વિદ્યાશાખા અંતર્ગત અનુસ્નાતક વિભાગો, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૨. સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓ
૩. ડૉ. જગદીશ એચ. પ્રજાપતિ (ડીનશ્રી – વિજ્ઞાન વિદ્યાશાખા),સરકારી સાયન્સ કોલેજ, **થરાદ.** જિ. બનાસકાંઠા
૪. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (પાંચ નકલ)
૫. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)
૬. સીસ્ટમ એનાલીસ્ટ, કોમ્પ્યુટર(રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ. યુનિવર્સિટી,પાટણ તરફ વેબસાઈટ પર મૂકવા સારૂ.
૭. પ્રવેશ પ્રશાખા(એકેડેમિક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.
૮. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમ. ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ–પરિપત્રની ફાઈલ અર્થે
૯. સિલેકટ ફાઈલે– (૨ નકલ)

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Programme code :		Programme Name :	B.Sc.
Faculty :	SCIENCE	Semester :	V
Subject :	CHEMISTRY		
Effective from :	June 2022 થી		

Sr.	Paper Code	Name of Paper	Credit
1	CC CH-501	INORGANIC CHEMISTRY-I	3
2	CC CH-502	ORGANIC CHEMISTRY-II	3
3	CC CH-503	PHYSICAL CHEMISTRY-III	3
4	CC CH-504	STRUCTURAL -ANALYTICAL CHEMISTRY-IV	3
5	SE CH -505 A	SYNTHETIC DYES	2
	SE CH -505 B	SPECTROPHOTOMETRY	
6	GE CH 506	ELECTIVE (GENEIC) COURSE	2
7	LC CH-507 A	LABORATORY COURSE-I INORGANIC CHEMISTRY PRACTICALS	1.5
	LC CH-507 B	LABORATORY COURSE-II ORGANIC CHEMISTRY PRACTICALS	1.5
	LC CH-507 C	LABORATORY COURSE-III PHYSICAL CHEMISTRY PRACTICALS	1.5
	LC CH-507 D	LABORATORY COURSE-IV VIVA -VOCE	1.5

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PATAN

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

University Road, P.O.BOX NO: 21, PATAN-384265

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NAAC Accreditation Grade – "B"

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FACULTY OF SCIENCE

CHEMISTRY SYLLABUS

(Effective from June-2022)

B.Sc. (semester V & VI Programme)

The proposed new courses in chemistry for under graduate classes are reassigned in accordance to semester/CBCS/Grading system with new education policy. The new course is based on model curriculum of the university grants commission.

The medium of instruction should be Gujarati and the question paper should be drawn in Gujarati with the English version. Students are permitted to write answer in English or Gujarati language.

Its objective are as under:

1. To meet the growing demand of Specialization and Advanced Courses in applied science.
2. To help the colleges to update and modernize their laboratories.
3. To redesign the courses the special emphasis on local requirements, environment, to link the courses with requirements of the industries and research
4. To prepare for National level entrance test like NET/SLET/JRF and other competitive exams.

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FACULTY OF SCIENCE
CHEMISTRY SYLLABUS
(Effective from June-2022)

Common Formula For Question Paper (Core course)

Time: 3 Hours **Total Marks:70**

Theory Examination Pattern(Core Course):

Que.No:1	A: Write any Two out of Three Questions	12 Marks
	B: Write any One out of Two Questions	05 Marks
Que.No:2	A: Write any Two out of Three Questions	12 Marks
	B: Write any One out of Two Questions	06 Marks
Que.No:3	A: Write any Two out of Three Questions	12 Marks
	B: Write any One out of Two Questions	05 Marks
Que.No:4	Write any Three Questions out of Five Questions. (Ask Questions from Unit-1,2 and 3 With Equal Sharing.)	18 Marks

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B. Sc. Chemistry

Semester : V

Inorganic Chemistry

Paper : CC CH-501

UNIT -I: Reaction Mechanism of Coordination Compounds

- Substitution reaction of square plannar complexes
- Reaction of Platinum Il complexes, the trans effect, theories of trans effect, use of synthesis in trans effect and analysis
- Substitution reaction in octahedral complexes, Possible mechanism reactions, Ligand displacement reaction in octahedral complexes, acid hydrolysis, Base hydrolysis
- Electron transfer reaction, mechanism of redox reaction, mechanism of substitution in square plannar complexes

UNIT- II : Organo Metallic Compounds

- Definition
- Types of O.M.C.
- Classification
- Nomenclature of O.M.C
- Structure and bonding in dihapto and metal olifines complexes. e.g. Ziese's salt complexes, ferrocine structure
- O.M.C. of Li and Al complexes

UNIT- III : Corrosion

- Principle of corrosion
- Types of corrosion
- (I) Wet corrosion
- (II) Dry corrosion
- (III)Galvanic corrosion
- (IV) Atmospheric corrosion
- (V) Pitting corrosion
- (VI) Inner granual corrosion
- (VII) Dezincfication
- Prevention of corrosion: Inhibitors- Definition, type and use of inhibitors.

Books Suggested (Inorganic Chemistry):

1. Valance and molecular structure by Cartmell and Flower.
2. Text book of Inorganic Chemistry by Durent and Durent.
3. Inorganic Chemistry by S. Chand.
4. Advance Inorganic Chemistry Vol-Il Satya Prakash (S.Chand)
5. Concise Inorganic chemistry by J.D.Lee.
6. Metalic Corrosion By M.N. Desai
7. Advance Inorganic Chemistry J.E. Huhee.

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B. Sc. Chemistry

Semester : V

Organic Chemistry

Paper : CC CH-502

UNIT-I : Stereochemistry

- Conformational analysis of mono and di substituted cyclohexanes
- Molecular asymmetry as illustrated by allenes and diphenyls
- Isomerism of oximes.
- Determination of geometrical isomerism of Aldoxime.
- Determination of geometrical isomerism of Ketoxime(Beckmann's transformation)

UNIT- II

(A) Carbohydrates

- Introduction of Disaccharides
- Structure determination of
  (1) Sucrose
  (2) Maltose
  (3) Lactose

(B) Isoprenoids

- Classification
- General methods of structure determination
- Isoprene rule
- Contitution of Citral, α-Terpeneol and Camphor with their synthesis

UNIT- III : Nucleophilic substitution at saturated carbon atom

- The reaction mechanism
- Mechanism of SN^1 and SN^2 reactions
- Stereochemistry of reaction SN^1 and SN^2 reactions
- Relative reactivity in substitution
- Solvent effect variation at carbon site
- Relative leaving group activity
- Neighboring group participation
- Competitive reactions. Elimination E_1, E_2 and E_{1cb} mechanisms

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Books Suggested (Organic Chemistry):

1. Organic chemistry by Morrison & Boyd Vth Edition
2. Advance organic chemistry by R.K.Bansal.
3. Organic chemistry by I.L.Finar Vol. l &.Il Vth Edition
4. Organic chemistry by pine, Hendrikson, Cram and Hammond IVth edition...
5. Outline of chemical technology by Dryden IInd Edition
6. Synthetic organic chemistry by Gurdeep R Chatwal.
7. Advanced organic chemistry by Jerry March.
8. Organic reactions and their mechanisms IInd edition by P.S. Kalsi.
9. Stereo chemistry: conformation and mechanism VIth edition by P.S.Kalsi.
10. Organic chemistry of natural product Vol: I & Il by Gurdeep R. Chatwal.
11. Advanced organic chemistry by Arun Bahal and B.S. Bahal.
12. Organic chemistry Vol, I, II, III by S.M.Mukherjee, S.P.Singh, R.P.Kapoor.
13. Stereo Chemistry by Nasipuri.
14. Advanced Organic Chemistry by L.D.S. Yadav & Jagdambasingh, Pragati prakashan

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B. Sc. Chemistry

Semester : V

Physical Chemistry

Paper : CC CH-503

UNIT-1: Electro Motive Force

- Introduction of Terms
  - Oxidation, Reduction, Redox, Anode, Cathode
  - Electrode, Half cell
  - Oxidation & Reduction Potential
  - Galvanic cell
  - Chemical Cell
  - Electro Chemical Series
  - Nearnst Equstion
- Without Transference with Transference Verification of
- Concentration cell and it's EMF equation.
- Electrolyte concentration cell
  Concentration cell without transference, Concentration cell with transference
- Electrode concentration cell
- Liquid -Liquid junction potential

❖ Application of EMF measurements Determination of

- Degree of hydrolysis of salt Solubility of sparingly soluble salt
- Stability constant of complex
- Equilibrium constant
- pH
- Ionic constant of water
- Dissociation constant of weak acid,
- Numericals

UNIT:-II: Thermodynamics

- Zeroth law of thermodynamics
- Absolute temperature scale
- Nernst heat theorem
- Third law of thermodynamics
- Determination of absolute entropy
- Experimental verification of third law
- Entropy change in chemical reactions.
- Fugacity and Activity
  - ➢ The concept of Activity & Activity Coefficient
  - ➢ Determination of Fugacity of Gas
  - ➢ Fugacity of a gas in a gaseous mixture
  - ➢ Fugacity of a Liquid Component in a Solution
  - ➢ Physical Significance of fugacity

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- Concept of Fugacity and determination of Graphical Method & Approximation method
- Numerical

UNIT- III: The Colloidal State

- Introduction
- Types of Colloidal System
- Classification of Colloids
- Difference between True Solutions, colloidal solution and suspension.
- Preparation of Colloidal Solutions.
  (a) Dispersion Methods.
  (b) Condension Methods.
- Purification of Colloidal Solutions.
  (a) Dialysis
  (b) Ultra-filtration.
- Properties of Colloidal solution.
  (i) Physical
  (ii) Colligative
  (iii) Optical
  (iv) Kinetics
  (v) Electrical
  (vi)Electro kinetics properties (Zeta potential)
- Electro phoresis
- Electro Osmosis
- Stability of Colloid (Rule of Schulze Hardy)
- Gold number
- Donan membrane equilibrium and calculation of molecular Weight
- Gels and Emulsion
- Foams, Theory of Foamstability, Antifoamers.
- Importance and applications of Colloids

Books Suggested (Physical Chemistry):

1. Advance Physical Chemistry by Gurdeepraj.
2. Physical Chemistry (Question and Answer) by R. N. Madan, G.D. Tuli, S.Chand.
3. Principal of Physical Chemistry by Puri, Sharma, Pathania.
4. Chemical Thermodynamics by R.P. Rastogi and R.R. Mishra.
5. Physical chemistry by atkins.
6. Essentials of Physical Chemistry by B. S. Bahal, Arun Bahal, G.D.Tuli,
7. Physical Chemistry by P.W. Atkins, 5th edn, Oxford 1994 7th edn-2002.
8. Physical Chemistry by R.A. Albern and R.J.Silby, John Wiley 1995.
9. Physical Chemistry by G.H. Barrow, 5th edn, Mac Graw Hill, 1988,6th edn, 1996.
10.Physical Chemistry by W.J. Moore, 4th edn, Orient Longmans 1969.

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B. Sc. Chemistry

Semester : V

Structural - Analytical Chemistry

Paper : CC CH-504

UNIT:-I: Symmetry of molecules

- Symmetry elements & symmetry operations
- Multiplications of symmetry operations
- Multiplication table for C_{2v}, C_{3v}, C_{2h} point groups only
- Classification of schoonflies point groups
- Determination of schoonflies point groups natations
- Symmetry & optical activity
- Symmetry property of orbital's for C_{2v}, C_{3v}, C_{2h} point groups

UNIT- II : NMR spectroscopy

- Introduction
- Proton magnetic resonance (1H NMR) spectroscopy
- Equivalent and non equivalent protons
- Enantiotopic and Diastereotopic Protons
- Nuclear shielding & de-sheilding
- Chemical shift & molecular structure
- Intensity of Signals
- Spin-spin splitting and coupling constant
- Simplification of Complex spectra
    - Double Resonance
    - Deuterium labeling
- NMR Based Examples by Using Spectral Data

UNIT:- III : Acid-Base titration

- Construction of titration curves (Neutralization of weak acid by strong base and weak base by strong acid only)
- Neutralization of polyprotic acid (Dibasic and tribasic acid only) by strong base
- Analysis of Soda Ash
- Titration of Boric acid
- Indicators, Mechanism of Indicators
- Gran's plot
- Buffer Solution, buffer level, buffer range & buffer capacity
- Numericals

Suggested books: (structural chemistry)

1. Chemical application of group theory by F.A.Cotton
2. Chemical bonding and introduction by K.C.Patel, R.D.Patel and Raval
3. Application of group theory to chemistry by Bhattacharya
4. Symmetry in chemistry by Jafle and Orchin 9 4–2013
5. Advance inorganic chemistry by cotton & Wilkinson
6. Basic principles of spectroscopy by R.Chand
7. Organic chemistry Vol. 1 by S.M.Mukherji, S.P.Shingh, Kapoor
8. Spectroscopy organic compounds Vlth edition by P.S.kalsi
9. Organic chemistry by Morrison and Boyd
10. Spectrometric identification of organic compounds IVth edition by Silverstain, Bassler and Morrill.
11. Application of absorption spectroscopy of organic compounds by John R. Dyer
12. Spectroscopic method in organic chemistry Vth edition by Dudley H. Williams & lan Fleming
13. Physical methods for chemist Ruwssell S. Drago
14. Organic spectroscopy by Williams & Kemp
15. Organic spectroscopy by V.R.Dani
16. Qualitative Analysis R.A.Day & A.L.Underwood
17. Analytical Chemistry G.D. Christain
18. Fundamentals of Analytical Chemistry D.A.Skoog, D.M. West & F.J.Holler
19. Principales of Analytical Chemistry J.H. Kennedy
20. Analytical Chemistry – Principals & Techniques L.G.Hargis

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B. Sc. Chemistry

Semester : V

Synthetic Dyes

Paper : SE CH-505 A

UNIT :-1:

- Introduction
- Synthetic Dyes
- Chromophores, Chromogens, Oxochroms, Bathochromic shieft, Hypsochromic shieft
- Difference between Dyes and Pigments
- Classification of Dyes
  - According to constitution
  - According to method of coloring the fibres
- Optical Brightners

UNIT :- II : Synthesis and uses

- Congo Red
- Eosin
- Alizarin
- Crystal violet
- Indigo
- Sefronine -T
- Methylene Blue
- Ereochrom Black -T
- Rhodamine
- Rosanilin

References Books :

1. Synthetic Dyes by Venkatramanan
2. Synthetic Dyes by G.R.Chatwal
3. Synthetic Dyes and Drugs by O.P.Agrawal
4. Synthetic Dyes by O. D. Tyagi & M. Yadav
5. Sanshlesit Rangako, Granth Nirman Board

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B. Sc. Chemistry

Semester : V

Spectrophotometry

Paper : SE CH-505 B

Unit-I: - Spectrophotometry

- Introduction, Theory of spectrophotometry and colorimeter. Lambert-Beer's law, Application of Lambert-Beer's Law, Introduction to Colorimetry ,Instrumentation of colorimeter.
- Spectrophotometry: Wavelength selection by prism and diffraction grating, Radiation source, cells, data presentation, single-beam spectrophotometer, Double-beam spectrophotometers, Numericals

Unit-II: - Atomic Spectroscopy

- Introduction, Principle, Flame Emission Spectroscopy (FES) and Atomic adsorption Spectroscopy (AAS), Principal, comparison and applications, Burners (Total consumption burner and Premix burners).

Reference Books

1. Analytical Chemistry by G. D. Christian, et al , Wiley, 6th Ed.
2. Principles of Instrumental Analysis: Holler, Skoog, Crouch 6th Ed. Thomson Publication
3. Modern Analytical Chemistry, David Harvey, Mc-Graw Hill Higher education

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Hemchandracharya North Gujarat University, Patan
B. Sc. Chemistry
Semester : V
Laboratory Course
LC CH-507
(Inorganic, Organic, Physical Chemistry)

This syllabus is to be completed by assigning four laboratory session per week, each of Three periods. The number of students in the laboratory batch should not exceed fifteen (15) the medium of instruction will be English in laboratory course

Inorganic Chemistry practical

(A) Alloy

1) Brass alloy ------- Zn (Gravimetric) and Cu (Volumetric)
2) German silver alloy ------Ni (Gravimetric) and Cu (Volumetric)
3) Bronze alloy ------Sn (Gravimetric) and Cu (Volumetric)

(B) Synthesis by Convention Method

1) Ferrous sulphate or Green vitriol ($FeSO_4$ $7H_20$)
2) Sodium cobaltinitrate Na_3 $[Co(NO_2)_6]$
3) Tetra amine cupric sulphate
4) Hexa thio urea plumbous nitrate
5) Cuprous chloride

Organic Chemistry practical

(A) Qualitative Analysis (Minimum 08)

Analysis of an organic mixture containing two components using water, $NaHCO_3$, NaOH, HCl as a solvent for Separation /or using distillation process for separation and identification with the suitable chemical tests and preparation of suitable derivatives.

Soluble Components:- Oxalic Acid, Succinic Acid, Resorcinol, Urea, Thiourea
(Give water soluble compounds only in solid + solid mixture and water soluble components should not given with same natured compound's mixture)

Separation of two components from Organic Mixture Such as....
Solid-Solid ------Mixture
Solid- Liquid -------Mixture

Liquid-Liquid ------ Mixture

[Liquid component must be neutral in nature]

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Physical Chemistry practical

[A] Instruments: (Minimum 05)

1. To Determine the Normality and Amount of each acid in given mixture of XN ($HCl+CH_3COOH$) by PH metric titration using 0.1 N NaOH.
2. To Determine the Normality and Amount of each acid in given mixture of XN ($HCl+CH_3COOH$) by Potentiometry titration using 0.1 N NaOH.
3. To Determine the Normality and Amount of each acid in given mixture of XN ($HCl+CH_3COOH$) by Conductometry titration using 0.1 N NaOH.
4. To Determine the Solubility & Solubility product of Sparingly Soluble salt $PbSO_4$/$BaSO_4$ by Conductometry.
5. Determine the Concentration of Mn^{+2} ions and Cr^{+3} ions in in a given mixture of ($K_2Cr_2O_7 + KMnO_4$).
6. To Determine the Amount of Nickel in the given unknown solution by Colorimetric method.

[B] Chemical Kinetics & Adsorption:

7. To determine the order of reaction between $K_2S_2O_8$ and KI.
8. To determine the order of reaction between H_2O_2 and HI.
9. To study the adsorption of Acetic acid/Oxalic acid on animal charcoal and prove the validity of Freundlich Equation.

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B. Sc. Chemistry

Semester : V

Pattern of University Practical Exam

Time: 11:00am to 5:30pm (Including 30 minutes recess) **Total Marks: 200**

First Day

(A) Inorganic (50 marks)

-Estimation from Alloy (30 marks) and Inorganic Preparation (20 marks)

(B) Organic (50 marks)

- Qualitative analysis of an organic mixture.

Second Day

(C) Physical (50 marks)

- Any one exercise should be selected for each candidate from syllabus.

(D) Viva-Voce and Journal

- **Viva-Voce on practical base (40 marks)**

Inorganic ..... 13 marks

Organic ..... 13 marks

Physical ..... 14 marks

- **Journal (10 marks)**

➢ **Note: Certified practical journal is compulsory for practical exam.**

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B. Sc. Chemistry

Semester : V

Suggested batch distribution for practical exam

First Day:

11:00am to 2:00pm	2:30pm to 5:30pm
Inorganic: A Organic: B Physical: C	Inorganic: B Organic: C Physical: A

Second Day :

11:00am to 2:00pm	2:30pm to 5:30pm
Inorganic: C Organic: A Physical: B	Inorganic viva- All students (A,B & C batch) Organic viva- All students (A,B & C batch) Physical viva- All students (A,B & C batch)

Batch distribution (for maximum 30 students and 3 Examiners)

[Maximum 10 Students per each Examiner]

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હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in Website : www.ngu.ac.in

પરિપત્ર ક્રમાંક – ૧૩૦ / ૨૦૨૨

વિષયઃ વિજ્ઞાન વિદ્યાશાખાના સ્નાતક કક્ષાના નવા અભ્યાસક્રમો અંગે...

આ યુનિવર્સિટી સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાએ કરેલ ભલામણ અનુસાર નીચેના વિષયોના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો **જૂન – ૨૦૨૨ થી ક્રમશઃ અમલ માં આવે તે રીતે** એકેડેમિક કાઉન્સિલએ તેની તા. ૧૨/૦૪/૨૦૨૨ ની સભા ના નિર્દિષ્ટ ઠરાવો થી મંજૂર કરેલ છે. જેનો અમલ કરવા સારૂ સંબંધિતોને આ સાથે મોકલવામાં આવે છે, જેનો ચુસ્ત અમલ થવા વિનંતી છે.

ક્રમનં.	અભ્યાસક્રમ	એકેડેમિક સભાના ઠરાવક્રમાંક	સેમેસ્ટર
૧	વનસ્પતિશાસ્ત્ર	૨૪	સેમ.–૫ અને ૬
૨	ગણિતશાસ્ત્ર	૨૬	સેમ.–૫ અને ૬
૩	ભૌતિકશાસ્ત્ર	૩૦	સેમ.–૫ અને ૬
૪	રસાયણશાસ્ત્ર	૫૩	સેમ.–૫ અને ૬

આ બાબતની સંબંધિત અધ્યાપકો તથા વિદ્યાર્થીઓને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

નોંધઃ (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજ ના ગ્રંથાલયમાં મૂકવાની રહેશે.
(૨) આ અભ્યાસક્રમ યુનિવર્સિટીની વેબ સાઈટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

સહી/–
અધ્યક્ષ
કા.કુલસચિવ

બિડાણઃ ઉપર મુજબ

નં.–એ કે / અ× સ / ૧૧૭૫ / ૨૦૨૧
તારીખ : ૦૧ / ૦૬ / ૨૦૨૨

પ્રતિ,

૧. અધ્યક્ષશ્રી/ કો.ઓર્ડીનેટરશ્રી –વિજ્ઞાન વિદ્યાશાખા અંતર્ગત અનુસ્નાતક વિભાગો, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૨. સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓ
૩. ડૉ. જગદીશ એચ. પ્રજાપતિ (ડીનશ્રી – વિજ્ઞાન વિદ્યાશાખા),સરકારી સાયન્સ કોલેજ, **થરાદ.** જિ. બનાસકાંઠા
૪. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (પાંચ નકલ)
૫. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)
૬. સીસ્ટમ એનાલીસ્ટ, કોમ્પ્યુટર(રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ. યુનિવર્સિટી,પાટણ તરફ વેબસાઈટ પર મૂકવા સારૂ.
૭. પ્રવેશ પ્રશાખા(એકેડેમિક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.
૮. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમ. ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ–પરિપત્રની ફાઈલ અર્થે
૯. સિલેકટ ફાઈલે– (૨ નકલ)

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Modified Detailed Syllabus of CBCS PROGRAMME Pattern for B Sc Mathematics Semester System

With Effect from June: 2022

FACULTY	:	SCIENCE
SUBJECT	:	MATHEMATICS
CLASS	:	Bachelor of Science.
SEMESTER	:	V to VI
TOTAL PAGES	:	01 TO 20 (WITH COURSE STRUCTURE)
DATE	:	June 22, 2022.

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B.Sc. in Mathematics: PROGRAMME Structure under CBCS

With Effect from June: 2022

Hemchandracharya North Gujarat University, Patan-384265.

Mission: Our mission is to provide opportunities for developing basic-quality mathematical skills and achievement for their betterment of life through scientific and technological development.

Learning outcomes: Four major focusing areas: Logical Reasoning & Motivation; Analysis & Problem solving; Information & Technology Proficiency.

Vision: To Motivate Individuals to excel in the mathematical basic knowledge-driven environment of the 21st century through curriculum and train integrally human resources through teaching. We **Focus** on quality education.

(1) EDUCATIONAL AIMS:

Mathematics is one of the fundamental disciplines in science. It is the basic for all the disciplines. To make education more effective and learner centric, restructurisation of curriculum becomes essential. As a positive step in this direction and in order to respond to the emerging trends in the global scenario, it is decided to introduce the Choice Based Credit System (CBCS) from the academic year 2011-12 and modified it after three years. Under this system, the academic programme becomes student-oriented, relevant, interdisciplinary and flexible.

(2) CONDITIONS FOR ADMISSION :

A candidate who has passed the H Sec-Science Degree examination of the state or any other examinations accepted by the Syndicate as equivalent thereto shall be eligible for admission to this B Sc Programme in Mathematics on full-time basis of study.

INTAKE rules for admission are as per University notification from time to time.

Students are allowed to take admissions to successive semesters under carry over benefit facility as per the norm decided by the university .

(3) *LEARNING OUTCOMES :*

The programme leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding in the following areas:

- **Knowledge and understanding :** When one has completed this degree he/she will have knowledge and understanding of the fundamental concepts, principles and techniques from a range of topic areas.
- **Cognitive skills :** When one has completed this degree he/she will be able to understand how to solve some problems using the methods taught and develop abstract mathematical thinking .
- **Practical skills :** When one has completed this degree, he/she will be able to demonstrate the Communicate clearly knowledge, ideas and conclusions about mathematics and improve his/her own learning and performance.

(4) DURATION OF THE COURSE:

The CBCS pattern B. Sc. programme with multidisciplinary approach in Mathematics is offered on a full-time basis. The duration of the course is of three academic years consisting of six semesters each of 15 weeks duration.

(5) TEACHING, LEARNING METHODS :

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All relevant material is provided and taught in the course texts and through the study of set books. One will build up knowledge gradually, with sufficient in-text examples to support one's understanding. He/She will be able to assess his/her own progress and understanding by using the in-text problems and exercises at the end of each unit in form of practical using computer in computer laboratory.

(6) COURSE OF STUDY :

The curriculum has five major components:

1. *Principle/Core Courses (CC MAT)*
2. *Practical courses (PC MAT)*
3. *Elective Opt. Disciplinary courses (ES MAT)*
4. *Elective Generic course*
5. *Foundation Course*

There are at least 144 Credit COURSEs prescribed in the above classification as per the university norms to be studied to acquire B.Sc. Degree in Mathematics.

⇛ COURSE STRUCTURE ☒

Course	Courses	Credit /course	Teaching Hrs Total	Total Credits	Examination Internal	Hours	External	Total Marks
SEMESTER-I								
Principle/Core Courses: CC-MAT-111	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-111	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –11 Set Theory & Functions	1	2	2	2	15	2	35	50
Elective Generic	1	2	2	2	15	2	35	50
Foundation Course	1	2	2	2	15	2	35	50
SEMESTER-II								
Principle/Core Courses: CC-MAT-122	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-122	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ESMAT –21 Industrial Mathematics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	50	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-III								
Principle/Core Courses: CC-MAT-301	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-302	1	3	3	3	30	2.5	70	100

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Practical /PC- MAT-301	1	1.5	3	1.5	-	5	50	50
Practical /PC -MAT-302	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –31 Numerical Solution of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-IV								
Principle/Core Courses: CC-MAT-401	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-402	1	3	3	3	30	2.5	70	100
Practical/ PC- MAT-401	1	1.5	3	1.5	-	5	50	50

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Practical/ PC MATH-402	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –41 Improper Intrgrals	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-V								
Principle/Core Courses: CC-MAT-501	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-502	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-503	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-504	1	3	3	3	30	2.5	70	100
Practical/PC MAT-501	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-502	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-503	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-504	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ESMAT –51 Theory of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-VI								
Principle/Core Courses: CC-MAT-601	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-602	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-603	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-604	1	3	3	3	30	2.5	70	100
Practical/PC MAT-601	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-602	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-603	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-604	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –61 Business Statistics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50

N.B. : *Work-load depends on the number of students and the number of Batches/Groups , for Practical and Cognitive-skill based Course.*

As the *CBCS has a high probability to be operationalised efficiently and effectively for the elevating learners* , the Essential Requirements for all Mathematical Practical including MATLAB / PYTYHON / SCILAB practicals of Mathematical subjects are as under:

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1. **Mathematical Laboratory inbuilt with sufficient number of Computers (as per the students enrollments and the number of practical batches) and MATLAB / PYTYHON / SCILAB SOFTWARE with basic requirements for the Practicals.**
2. **Mathematical Laboratory inbuilt with Graphs, Charts, Printer, Physical Models (two dimensional as well as three dimensional) & Virtual Models (Higher Dimensional – Computerized) and basic requirements for the same.**
3. ***Essential Requirement for Mathematical Computer Laboratory:***

   At least One full time Computer Operator and one Peon for computer laboratory having mathematical ability to run MATLAB / PYTYHON / SCILAB Software and related Computerized Mathematical practicals.

B.Sc. (Mathematics) Semester-5

CC-MAT-501 Group Theory

UNIT-01:

Definition of a Group and Its applications , Elementary properties of a Group, Equivalent definitions of a Group, Generalized form of Associative Law, Finite Groups and their tables, Definition of a Subgroup and Its applications, Lagrange's theorem and its applications.

UNIT-02:

Definition of a Permutation and Its applications, Transpositions and cycle, Definition of a Normal subgroup and its applications, Quotient group, Definition of homomorphism of group and its applications, Kernel of Homomorphism.

UNIT-03:

Isomorphism between groups, Groups of order four and six, cyclic group and its Properties, Isomorphism of cyclic groups, Subgroup of a cyclic group, Generator of a cyclic group, Cayley's Theorem, Fundamental theorem of homomorphism.

The course is covered by the Book: **I H Sheth, Abstarct Algebra**, Prentice Hall of India (PHI) Publication. Chapter 6(6.1 to 6.7), Chapter 7(7.1 to 7.3), Chapter 8(8.1 to 8.3), Chapter 9(9.1 to 9.3), Chapter 10(10.1 to 10.2), Chapter 11(11.1 to 11.5), Chapter 12(12.1 to 12.6)

- **Reference books :**

1. I N Herstein, Topics in Algebra, Wiley Eastern Ltd.
2. N. Jacobson, Basic Algebra Vol I & II, Hindustan Publishing company
3. Shanti Narayan, A text book of Modern Algebra, S. Chand & Co.
4. P.B.Bhattacharya, S.K.Jain, S R Nagpal, Basics Abstract Algebra, (second Edition), Cambridge University Press.
5. N.S. Gopalkrishna, University Algebra, Wiley Eastern, New Delhi
6. Maclane Saunders and Birkhoff Garrett, Algebra, MacMillan, New York.
7. G.F.Simmons, Introduction to Topology and Modern Analysis, MacGrawHill Inc., U.S.A.

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CC-MAT-502 Mathematical Analysis-I

Unit-01 Number System and Countability of set:
The real field to be developed by ordered set approach, Equivalence of this approach, extended real number system, The complex number system, Euclidean spaces. Finite, Countable and Uncountable sets

Unit-2 Basic Topology:
Metric space, Neighborhoods in metric spaces, Limit point of a set, Open, Closed, Bounded, Compact, Perfect, Connected and Convex subsets of metric spaces.

Unit-3 Sequences and Series:
Convergence sequence, Sub sequences, Cauchy sequences, Upper and lower limits, Special sequences and Series, Series of non negative terms, Roots and Ratio Test. Power Series with Real (Complex) terms, Interval (circle) of convergence and radius of convergence of a power series, Summation by parts, absolute convergence, addition and multiplication of series.

The course is roughly covered by Chapters 1,2,3 (Omit 3.52 to 3.55) of The book entitled **"Principles of Mathematical Analysis" by Walter Rudin**, McGraw Hill (International Student Edition), 3rd Edition.

- **Reference books:**

1. "A First Course in Mathematical Analysis" by D. Somasundaram & B. Choudhary, Narosa Publishing House
2. "Fundamentals of Mathematical Analysis" by G. Das & S. Pattnayak Tata Mcgraw Hill Pub.Co
3. "Fundamental of Real Analysis" by S. L. Gupta & Nisha Rani – Vikas Pub. House Pvt. Ltd. New Delhi-1974.
4. "Principle of Real Analysis "by S.C.Malik , Wiley Eastern Limited New Delhi 1982.
5. "Principle of Mathematical Analysis" by T.M.Apostol

CC-MAT-503-A DIFFERENTIAL EQUATIONS

Unit-01 Homogeneous linear equations with variable coefficients:
Method of solution, to find C.F., Symbolic notation in θ, definition of $\frac{1}{f(\theta)}X$ to find particular integral, particular case to find $\frac{1}{f(\theta)}x^n$, equations reducible to homogeneous linear equations,

Unit-02 Exact Differential equations and Equations of particular form:
Condition of Exactness of the linear differential equations, Solution of non-linear equations which are Exact, Equations of the form y(n)=f(x), Equations of the form y(2)=f(y), Equation do not contain y directly, Equation that do not contain x directly, Equation in which y appears in only two derivatives whose orders differ by two, Equation in which y appears in only two derivatives whose order differ by unity.

Unit-03 Linear Equation of 2nd order:

Method of solving y(2)+Py(1)+Qy=R when an integral included in the C.F. is known, Method of solving y(2)+Py(1)+Qy=R by changing the dependent variable, y(2)+Py(1)+Qy=R by changing the independent variable, Solution by factorization of the Operator, Method of variation of Parameters, Method of Undetermined Co-efficient.

- The course is covered by "**A text book of Differential Equations**", by N.M.Kapoor, Pitamber publication, New Delhi.
  [Chapters: 5, 6, 7]

- **REFERENCE BOOKS:**

1. Erwin Kreyszing, Advanced Engineering mathematics, By. John Wiley & Sons Inc. New York, 1999.
2. D.A.Murray, Introductory course on Differential Equations, By. Orient Longman,(India), 1967.
3. A.R.Forsyth, A Terastise on Differential Equations, Macmillan and Co.Ltd., London.
4. Ian N. Sneddon, Elements of partial Differential Equations, McGraw-ill Book Compony, 1998. H
5. Fracis B. Hilderbrand, Advanced Calculus for Application, Prentice Hall of India Pvt. Ltd., New Delhi, 1977.
6. Jane Cronin, Differential Equations, Marcel Dekkar, 1994.
7. Frank Ayres, Theory and Problems of Differential Equations, McGraw-Hill Book Compony, 1972.

CC-MAT-503-B Complex Analysis

UNIT-01 Complex Numbers:

Complex Numbers, its conjugates, and moduli, exponential form, basic algebraic and geometric properties, arguments of products and quotients, nth roots of complex numbers. Region in complex plane.

UNIT-02

Functions of complex variable, mappings, limits, Theorems on limits, limits involving the point at infinity, Continuity, derivatives, differentiation formulas, convergence of complex sequences and series.

UNIT-03

Cauchy-Riemann equations, sufficient conditions for differentiability, Cauchy-Riemann equations Polar coordinates form, Analytic functions, harmonic functions.

- **Textbook:** "**Complex Variables and Applications**" Fifth Edition, Ruel V. Churchill and James Ward Brown, Mc Graw Hill Publishing Company.

- **Reference Books :**

1. Complex variables and applications, by R. V. Churchill and J. W. Brown
2. Theory of functions of a Complex variables, by Shantinarayan, Chand & Co.
3. Complex variables, Introduction and applications, by Mark Ablowitz and A. S. Fokas, Cambridge University Press.

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CC-MAT-504-A Discrete Mathematics

UNIT-01:

Relations, Equivalence Relation, Equivalence classes or sets, Partial order Relations, Hasse Diagram, Upper and Lower Bounds, Minimal and Maximal elements ,Binary operations, closure operations, Partially Ordered Set, Totally Ordered Set, Lattices as Posets, Dual Lattice, Meet and Join, Lattice as an algebraic, structure, Direct Product Of two Lattices, Lattice Homomorphism, Lattice Isomorphism.

UNIT-02:

Sub-Lattice, Completed Lattice, Bounded Lattice, Distributive Lattice, Square Free Lattice, Complemented Lattice, Modular Lattice, De Morgan's Law, Boolean Algebra, Boolean Algebra of Switching Circuits, Sub Boolean Algebra, Homomorphism and Isomorphism of Boolean Algebras, Atoms, Unique representation Theorem, Properties Of Set of Atoms, Stone's representation Theorem.

UNIT-03

Boolean Variables, Boolean Expression, Min term, Max term, Representation of Boolean Expression as a sum of Product Canonical Form and as a Product of Sum Canonical Form, Boolean Function Associated With Boolean, Expression, Symmetric Boolean Expression, Representation of Boolean Functions And Minimization of Boolean Expression: Using Truth Table, Cube array Method, Karnaugh's Method, Circuit Diagrams.

- **REFERENCE BOOKS:**

1. An Introduction To Discrete Mathematics -Udayan M.Prajapati, Dr.Ajay S. Gor, Nirav Prakashan
2. Discrete Mathematical Structures with Applications to Computer Science by Trembley I.P.And Mahonar R.
3. Discrete Mathematical Structures With applications to Computer Science by R. Hamming and E.A. Feigenbaum
4. Discrete Mathematical Structures for Computer Science by B. Kolman and R.C.Busy
5. The Essence of Discrete Mathematics by Neville Dean
6. Discrete Mathematics and its Applications with Combinatorics and Graph theory, by – Kenneth H. Rosen, McGraw Hill -2007 7th Edition.

CC MAT-504-B Optimization Techniques

Unit-01

Introduction: Nature and scope of Operations Research, Linear programming: (a) Formulation of LPP, LPP Model and method of solution- Graphical method, Slack-Surplus and unrestricted variables, Simplex Algorithm, Simplex Method.

Unit-02

Artificial Slack variables, Two phase method, Big-M / Penalty method, Variation in simplex method solution- unbounded, infeasible solutions and concept of degeneracy.

Unit-03

(a) Duality Theory:

The essence of duality theory, primal-dual relationships, Duality theorems, Dual simplex method.

(b) Integer Programming:

The need of integer solutions, The concept of the Cutting– Plane, Gomory's Cutting Plane Algorithm.

- **REFERENCES BOOKS:**

1. Operations Research , by. J.K.Sharma. Macmillan Publishers India Ltd.
2. Operations Research by Nita Shah, Ravi Gor and Hardik Soni, Prentice Hall of India.
3. Operations Research(Principles and Practice) by Pradeep Prabhakar Pai, Oxford University Press.
4. Operations Research by Prof. N.P. agarwal, Ramesh Book Depot, Jaipur.

PC-MAT-501 to 504

- **Objectives:**
  - Understand the MATLAB Desktop, Command window and the Graph Window.
  - Be able to do simple and complex calculation using MATLAB.
  - Understand the graphics capabilities of MATLAB
  - Be able to carry out mathematical computations using MATLAB Symbolic Toolbox

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PC-MAT-501 Introduction to MATLAB

Starting and ending MATLAB session, MATLAB environment, MATLAB help, types of files, search path, some useful MATLAB commands, data types, constant and variables, operators, built-in functions, assignment statement, illustrative programs.

Vectors and Matrices Scalars and vectors, entering data in matrices, line continuation, matrix subscripts/indices, multi-dimensional matrices and arrays, matrix manipulations, generation of special matrices, useful commands, matrix and array operations, function with array inputs.

PC-MAT-502 Polynomials

Entering a polynomial, polynomial evaluation, roots of a polynomial, polynomial operations - addition and subtraction, multiplication, division, formulation of polynomial equation, characteristic polynomial of a matrix, polynomial differentiation, integration, and curve fitting, evaluation of polynomial with matrix arguments.

PC-MAT-503 MATLAB Graphics

Two-dimensional plots, multiple plots, style options, legend command, subplots, specialized two-dimensional plots, three-dimensional plots.

PC-MAT-504 Symbolic Processing With MATLAB

Symbolic Expressions and Algebra, Algebraic and Transcendental Equations, Calculus, Symbolic Linear Algebra, ordinary and partial differential equation, Symbolic Tutors.

- **Text Book:**
  "**MATLAB and its Applications in Engineering**" Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, Pearson.

- **Coverage from the Text Book:**
  PCMAT-501 Chapter 1: 1.8, Chapter 2: 2.9 Chapter 3: 3.11
  PCMAT-502 Chapter 4: 4.13
  PCMAT-503 Chapter 6: 6.8
  PCMAT-504 Chapter 9: 9.3 only. Additional commands for symbolic toolbox are to be covered from the list given below.

Symbolic Math Toolbox

Functions for Creating and Evaluating Symbolic Expressions	
Class	Returns the class of an expression.
Digits	Sets the number of decimal digits used to do variable precision arithmetic.
Double	Converts an expression to numeric form.
Ezplot	Generates a plot of a symbolic expression.
ezplot3	3-D parametric plot
Ezpolar	plot a 2-D curve in polar coordinates
Findsym	Finds the symbolic variables in a symbolic expression.
numden	Returns the numerator and denominator of an expression.
Sym	Creates a symbolic variable.
Syms	Creates one or more symbolic variables.
Vpa	Sets the number of digits used to evaluate expressions.
Functions for Manipulating Symbolic Expressions	
Collect	Collects coefficients of like powers in an expression.
Expand	Expands an expression by carrying out jpowers.
Factor	Factors an expression.
poly2sym	Converts a polynomial coefficient vector to a symbolic polynomial.
Pretty	Displays an expression in a form that resembles typeset mathematics.
Simple	Searches for the shortest form of an expression.
Simplify	Simplifies an expression using Maple's simplification rules.
Subs	Substitutes variables or expressions.
sym2poly	Converts an expression to a polynomial coefficient vector.
Symbolic Calculus Functions	
Diff	Returns the derivative of an expression.
jacobian	Compute the Jacobian matrix.
Dirac	Dirac delta function (unit impulse).
Heaviside	Heaviside function (unit step).
Int	Returns the integral of an expression.
Limit	Returns the limit of an expression.
symsum	Returns the symbolic summation of an expression.
Taylor	Returns the Taylor series of a function.

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Symbolic Linear Algebra Functions	
Det	Returns the determinant of a matrix.
Eig	Returns the eigenvalues (characteristic roots) of a matrix.
Inv	Returns the inverse of a matrix.
Poly	Returns the characteristic polynomial of a matrix.
Symbolic Tutors	
Arclen	Find the arclength of the curve.
composefun	compose two functions
dirdifftool	plot or animate directional derivatives
Eigtool	interactive matrix eigenvalues
gradtool	plot or animate gradient(s)
Linsys	plot a system of 2-D or 3-D linear equations
Ratfun	demonstrate the graphing of rational functions
Rsums	Riemann sum approximate integration tutor
taylortool	taylor approximation tutor

Assignment: The student should submit the electronic copy of diary file showing the execution/output of Matlab session(s).

N.B.: As the *CBCS has a high probability to be operationalised efficiently and effectively for the elevating learners*, the Essential Requirements for all Mathematical Practical including MATLAB Practicals of Mathematical subjects are as under:

5. **Mathematical Laboratory inbuilt with sufficient number of Computers (as per the students enrollments and the number of practical batches) and MATLAB SOFTWARE with basic requirements for the MATLAB Practicals.**
6. **Mathematical Laboratory inbuilt with Graphs, Charts, Printer, Physical Models (two dimensional as well as three dimensional) & Virtual Models (Higher Dimensional – Computerized) and basic requirements for the same.**
7. Use also "PYTHON" Software instead of MATLAB Software.
8. ***Essential Requirement for Mathematical Computer Laboratory:***

(i) Atleast One full time Computer Operator having mathematical ability to run Matlab Software and related Computerized Mathematical Practical.

(ii) One Peon for computer laboratory.

Subjective Elective

ES–MA-51 Theory of Equations

Unit-1 :

Relationships between roots and coefficients, Equations with real coefficients and imaginary roots, Equations with rational coefficients and irrational roots.

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Unit-2 :

Symmetric functions of roots, Formation of equations whose roots are given, Transformation of equations, Multiple roots. Method of least square approximation.

- **Reference Books :**
  1. Numerical Methods by Dr. V.N. Vedamurthy, Dr. N.Ch. S.N. Iyengar.
  2. Numerical Methods by S.K. Jain and S.R.K. Iyengar

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NAAC 'A' (3.02 C GPA) Accredited (State University)

U.G. (B. Sc.) Programme

CBCS :: Semester Grading Pattern

With Effect From
June- 2022 (In Continuation)

Faculty

SCIENCE

Subject

PHYSICS

SYLLABUS

PROGRAM CODE : HNGU1058

B.Sc. SEMESTER – V & VI

For Theory and Practical

Date : 14 /03/2022
Place : PATAN

Pri Dr J H Prajapati
CHAIRMAN
Board of Studies, PHYSICS
I/c. Registrar
Hemchandracharya
North Gujarat University
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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
Choice Based Credit System-Semester-Grading System
Under Graduate B Sc Programme
With Effective from June - 2022

The New course in B.Sc. PHYSICS (Sem-V & VI) UG syllabus (Programme) is based on Choice Based CreditSystem (CBCS) which is inforce from june-2022.

Salient Features of CBCS in UG programme:

1. Physics subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2022-23.
2. A student will have to get enrolled a **Core course** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting an **Elective** as well as **Foundation** courses from a pool of courses.
3. Each course shall be assigned a specific number of **Credits**.
4. A Core course is the course which should compulsorily be studied by a candidate as a Core requirement so as to get degree in a said discipline of study.
5. There shall be four **Core Compulsory** courses (Theory) each with **3 credits** and their practical's each with **1.5 credits**. Thus, a credit weight-age in Sem-V & VI of **B. Sc.** programme for each core course shall be of **4.5 credits**. In short, 4.5 credits multiplied by 4 core compulsory courses equal to total of **18 credits**.
6. In addition to the Core courses, a student will have to choose Elective as well as Foundation courses from a pool of courses.
7. **Two** courses of **Elective**, one each from **Generic Elective** and Interdisciplinary / Multidisciplinary **/ Subject centric electives** shall have to be offered. The credit weight-age for each Elective course shall be of **02 Credits**. Hence, a total credit weight-age for Elective courses shall be of **4 credits**.
8. One **Foundation** (English Language) course shall have to be offered. The credit weight-age for Foundation course shall be of **02 credits**.

Each course shall have a unique Course code. The Core courses, Elective courses and the Foundation courses shall be abbreviated respectively as **CC, PC, EG, ES and FC.**

1. Core Compulsory-**CC** Practical Core -**PC**
2. Elective Generic -**EG**
3. Elective Subject- **ES**
4. Foundation Compulsory- **FC**

Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to 90 working days. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.

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The course with **4 credits** shall be of **60 hrs**(15 weeks x 4 credits) duration. The course with **3 credits** shall be of **45 hrs**(15 weeks x 3 credits) duration. The course with **2 credits** shall be of **30 hrs**(15 weeks x 2 credits) duration.

A general framework for Bachelor of Science (B Sc) programme shall be as follows:

Semester wise credits						Toatal Creditsof the Programme
I	II	III	IV	V	VI	
24	24	24	24	24	24	144

The semester wise weightage of core, elective and foundation courses shall be as follows:

Academic Year	Core compulsory Courses	Elective courses	Foundation Courses
Semester I & II	75%	15-20%	10-15%
Semester III & IV	75%	15-20%	10-15%
Semester V & VI	75%	15-20%	10-15%

Total weight-age - 100%

Attendance:

The Attendance Rules as per the norms of Hemchandracharya North Gujarat University.

Medium of Instruction:

The Medium of Instruction shall be of **Gujarati medium**. Student is free to write answers either in **Gujarati** or **English** language.

Language of Question paper:

Question paper should be drawn in **Gujarati** language and its **English** version should be given.

Evaluation Methods:

1. A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**)/ (**Internal Evaluation**) as well as the **End of Semester examination** (**External Evaluation**). The weight-age of CCA shall be 30%, where as the weight-age of the Semester end examination shall be 70%. There will be **no internal evaluation in practical courses**.
2. The Semester assessment (**CCA**)/ (**Internal Evaluation**) is spread through the duration of the course and is to be done by the Teacher teaching the course. The assessment is to be done by various meansincluding:

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Internal Test-15 Marks Assignments –10 Marks Attendance -05 Marks

The performance of student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points. Evaluation for each course shall be done by continuous internal assessment as well as semester end exam and will be consolidated at the end of the course.

3. The **End of Semester examination** (**Theory Examination,External Evaluation**) shall have an assessment based upon following perspective with respect to all thecourses:

   - ✓ Evaluation with respect to Knowledge
   - ✓ Evaluation with respect to Understanding
   - ✓ Evaluation with respect to Skill
   - ✓ Evaluation with respect to Application
   - ✓ Higher Order Thinking Skills

4. With respect to all the above components, there shall be following types of Questions from each unit of the course.
   - ✓ Long answer questions
   - ✓ Medium answer questions
   - ✓ Short answer questions
   - ✓ Examples/ Problems,etc
   - ✓ MCQs/Fill in the blanks/ Match the pairs,etc.

Only Bord of Studies can change the Pattern of question paper of external examination.

5. The End of Semester Examination (Practical) will be conducted by the University. **A Certified Journal of the respective core compulsory course shall be produced at the time of practical examination. If a Student does not produce certified journal in the practical examination then examiner will be able to exclude him/her from practical examination.**

   In Practical Exam there will be four practicals (each from PC-501 to PC-504 for Sem-V & PC-601 to PC-604 for Sem-VI) each of 50 marks (35 Marks for practical+15 Marks for VIVA) and duration of each practical will be 3 hours. Numbers of student in a practical exam will be 16 per batch and examiners will be 2.

SCHEME OF ASSESMENT for Each Practical

No.	Name of the head	Marks
1.	Understanding and approach to the experiment, circuit layout, use of apparatus	10
2.	Tabulation with correct units and accuracy of reading, which is read and noted by the student and verified by examiner.	08
3.	Oral questions Regarding the experiment (Viva)	15
4.	Calculations by correct formula and graph with scale.	10
5.	Accuracy of the result as judged by comparing the students results with those supplied by expert assistant who has set the experiment.	02
6.	Marks for journal.	05
	Total	50

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6. It will be compulsory for a candidate to obtain passing percentage in both Internal as well as External Evaluation. The passing marks shall be **40%**, or as decided by concern Board of Studies of the Subject.
7. Promotion, Re-Admission and Time for Completion of Course, Procedure for Awarding Grades, Provision for Appeal, etc. as decided by the Hemchandracharya North Gujarat University.

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CBCS-Semester Grading Pattern

B.Sc. SEMESTER - V PHYSICS SYLLABUS

For Theory and Practical

From Academic year 2022-23

Unit	Physics Theory CC-PHY– 501 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY – 502 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY – 503 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY – 504 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3Hrs/Week	Elective Subject ES-PHY – 07 ES-PHY- 08 2Credit Total 50 Marks Internal 15 Marks External 35 Marks 2 Hrs/Week	Physics Practical PC:PHY-501 PC:PHY-502 PC:PHY-503 PC:PHY-504 6Credit Total 200 Marks (External) 12 Hrs/Week
I	Mathematical Physics	Statistical Mechanics	Nuclear Physics	Electronics	Student has to select one elective course from above two courses	There are Four Groups of Practicals. Each group Consists of 5 experiments. Total 20 experiments .
II	Classical Mechanics	Solid State Physics	Nuclear Physics	Electronics		
III	Quantum Mechanics	Plasma Physics	Molecular Spectra	Computer		

In order to give exposure of industry, research institute and higher learning in the field of physics, industrial visit may be arranged.

It is expected that students of B.Sc. (PHYSICS) Semester – V & VI must visit industry / research institute /institute of higher learning.

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B.Sc. SEMESTER - VI PHYSICS SYLLABUS
For Theory and Practical
From Academicyear2022-23

Unit	Physics Theory CC-PHY– 601 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY– 602 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY– 603 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Physics Theory CC-PHY– 604 3 Credit Total 100 Marks Internal 30 Marks External 70 Marks 3 Hrs/Week	Elective Subject ES-PHY – 09 ES-PHY- 10 2Credit Total 50 Marks Internal 15 Marks External 35 Marks 2 Hrs/Week	Physics Practical PC:PHY-601 PC:PHY-602 PC:PHY-603 PC:PHY-604 6Credit Total 200 Marks (External) 12 Hrs/Week
I	Mathematical Physics	Statistical Mechanics	Electrodynamics	Electronics	Student has to select one elective course from above two courses	There are Four Groups of Practicals. Each group Consists of 5 experiments. Total 20 experiments .
II	Classical Mechanics	Solid State Physics	Electrodynamics	Electronics		
III	Quantum Mechanics	Optics	Molecular Spectra	Computer Programming		

In order to give exposure of industry, research institute and higher learning in the field of physics, industrial visit may be arranged.

It is expected that students of B.Sc. (PHYSICS) Semester – V & VI must visit industry / research institute /institute of higher learning.

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B.Sc. Programme with 144 credits
CBCS-Semester-Grading Pattern w.e.f. June-2022

General Pattern/Scheme of study components along with credits for Science faculty.

SEMESTER	Course code	Study Components	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
B. Sc. Sem –V		**Semester-V**					
	CC:PHY-501	**Core Compulsory (CC) Course**					
	CC:PHY-502	Core Course-I (Paper-7)	3	30	70	100	3
	CC:PHY-503	Core Course-I (Paper-8)	3	30	70	100	3
	CC:PHY-504	Core Course-I(Paper-9)	3	30	70	100	3
		Core Course-I(Paper-10)	3	30	70	100	3
		Practical Core (PC) Course					
	PC:PHY-501	Practical Core Course-I (Paper-7)	3	--	50	50	1.5
	PC:PHY-502	Practical Core Course-I (Paper-8)	3	--	50	50	1.5
	PC:PHY-503	Practical Core Course-I(Paper-9)	3	--	50	50	1.5
	PC:PHY-504	Practical Core Course-I(Paper-10)	3	--	50	50	1.5
		Foundation Course (FC)					
	FC-5	Foundation (**Generic**) Course – V Compulsory English (L.L.)	2	15	35	100	2
		Elective Course (E)					
	EG-5	Elective (**Generic**) Course –V	2	15	35	50	2
	ES:PHY-07	Elective (**Subject**) Course –V	2	15	35	50	2
	ES:PHY-08		**30**	**165**	**585**	**800**	**24**
B. Sc. Sem-VI		**Semester-VI**					
		Core Compulsory (CC)Course					
	CC:PHY-601	Core Course-I (Paper-11)	3	30	70	100	3
	CC:PHY-602	Core Course-I (Paper-12)	3	30	70	100	3
	CC:PHY-603	Core Course-II (Paper-13)	3	30	70	100	3
	CC:PHY-604	Core Course-II (Paper-14)	3	30	70	100	3
		Practical Core (PC) Course					
	PC:PHY-601	Practical Core Course-I (Paper-11)	3	--	50	50	1.5
	PC:PHY-602	Practical Core Course-I (Paper-12)	3	--	50	50	1.5
	PC:PHY-603	Practical Core Course-II (Paper-13)	3	--	50	50	1.5
	PC:PHY-604	Practical Core Course-II (Paper-14)	3	--	50	50	1.5
		Foundation Course (FC)					
	FC-6	Foundation (**Generic**) Course – VI Compulsory English (L.L.)	2	15	35	100	2
	EG-6	**Elective Course (E)**					
	ES-PHY-09	Elective (**Generic**) Course –VI	2	15	35	50	2
	ES-PHY-10	Elective (**Subject**) Course –VI	2	15	35	50	2
			30	**165**	**585**	**800**	**24**

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B. Sc. Programme (CBCS-Semester-Grading pattern)
Semester end Examination (Sem-V & VI)
Format for Question paper for Elective Courses (Subject) in Physics

There will be three questions. First question will be from Unit - I, Second question from Unit-II, and Third question will be from both the Units. All the questions are detailed as under.

Time: 1.5 Hrs **Total Marks: 50**

1 (a) Answer the following (Any two out of three) 08 Marks
(Theory questions)
(b) Attempt any two of following (Out of three) 06 Marks
(Theory type **or** Application/Example/Problem)
(c) Attempt any three (Out of five) 06 Marks
(Short answer or objective type questions)

2 (a) Answer the following (Any two out of three) 08 Marks
(Theory questions)
(b) Attempt any two of following (Out of three) 06 Marks
(Theory type **or** Application/Example/Problem)
(c) Attempt any three (Out of five) 06 Marks
(Short answer or objective type questions)

3. Answer the following (Any ten out of twelve) 10 Marks
(M.C.Q. Type **or** objective type)

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B.Sc. Programme (CBCS-Semester Grading pattern) Semester end Examination (Sem-V & VI)

Format (Pattern) for Question paper of Core Compulsory Courses in Physics

There will be four questions. All questions are of 18,17,18& 17 marks each. First question will be from Unit - I, Second question from Unit-II, Third question from Unit-III, Forth question will be from all Three Units. Detailed about all the questions is as under.

Time: 2.5 Hrs **Total Marks: 70**

1	(a) Answer any one out of Two (Long Theory type questions)	08 Marks
	(b) Answer any Two Out of Three (Short Note/ Application/Example/Problem)	10 Marks
2	(a) Answer any one out of Two (Long Theory type questions)	07 Marks
	(b) Answer any Two (Out of Three) (Short Note/ Application/Example/Problem)	10 Marks
3	(a) Answer any one out of Two (Long Theory type questions)	08 Marks
	(b) Answer any Two (Out of Three) (Short Note/ Application/Example/Problem)	10 Marks
4	(a) Answer the following (Any Six out of Eight) (Short answer or objective type questions)	12 Marks
	(b) Answer the following (Any Five out of Seven) (Very Short answer or MCQ type questions)	05 Marks

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CBCS - Semester - Grading Pattern

B. Sc. Semester - VI

PHYSICS SYLLABUS (Effective from June-2022)

CC: PHY-601

MATHEMATICAL PHYSICS, CLASSICAL MECHANICS & QUANTUM MECHANICS

Course Objectives:

- To provide various numerical techniques for Legendre differential equation, Bessel differential equation, Hermite differential equation and can solve Leguerre, Legendre, Rodriguez's polynomials equations.
- To create awareness about motion of rigid body and get sufficient deep knowledge of Lagrange's and Hemilton's Equations and applications of them.
- To train the students in physical interpretations of the energy eigen functions, Properties of Stationary States, Coherent States.
- To give sufficient knowledge about the Angular momentum operators.

UNIT – I MATHEMATICAL PHYSICS

(a) Some Special Functions in Physics :

Legendre Differential Equation (6.1), Generating Function of Legendre Polynomial (6.2), Rodriguez's formula for Legendre Polynomial (6.3), Orthogonal Properties of Legendre Polynomial (6.4), Recurrence of relation for Legendre Polynomials (6.5), Bessel differential equation (6.6), Recurrence formulae Bessel's functions (6.7), Generating Function for $J_n(x)$ (6.8), Orthogonality of Bessel's Functions (6.9), Hermite differential equation and Hermite Polynomial (6.11), Generating function of Hermite Polynomial (6.12), Recurrence formula for Hermite Polynomial (6.13), Rodriguez's formula for Hermite Polynomial (6.14), Orhogonality of the Hermite polynomials(6.15) ***Related Examples, Problems & Short Questions***

Basic Reference: *Quantum Mechanics by Satya Prakash, Pragati Prakashan (Reprint-2008)*

Other References:

1. Mathematical Physics by B. D.Gupta.
2. Mathematical Physics by H.K.Dass.
3. Mathematical Physics by P K Chattopadhyay (Second Edition), New age Int. publishers

UNIT- II CLASSICAL MECHANICS

(a) Motion of Rigid Body :

Euler's theorem (10.1), angular momentum and kinetic energy (10.2), The inertia tensor (10.3), Euler's equations of motion (10.4) ***Related Examples, Problems & Short Questions***

(b) Variational Principle: Lagrange's and Hemilton's Equations :

Configuration Space (11.1), Some Techniques of Caclulus of Variation (11.2), Applications of The

Variational Principle (11.3), Hemilton's Principle (11.4). Equivalence of Lagrange's and Newton's Equations (11.5), Advantages of The Lagrangion Formulation-Electromechanical Analogies (11.6), Lagrange's undertermined Multipliers (11.7), Lagrange's Equation For Non- Holonomic System (11.8), Application of The Lagrangian Method of undetermined Multipliers (11.9), Hemilton's Equations of Motion (11.10), Some Applications of the Hamiltonian Formulation (11.11) ***Related Examples, Problems & Short Questions***

Basic Reference:
Introduction to Classical Mechanics by Takawale and Puranik. McHill Edu. Private Ltd. (Chennai)

Other References:
1. Classical Mechanics, by Goldstein. Narosa Publishing House, NewDelhi.
2. Classical Mechanics by Yasvant Waghmare.
3. Classical Mechanics by N.C.Rana and P. S. Joag, THM
4. Classical Mechanics by Gupta, Kumar and Sharma

UNIT -III QUANTUM MECHANICS

(a) Exactly Soluble Eigen Value Problems : The Simple Harmonic Oscillator
The Echrodinger Equation and Energy Eigenvalues (4.1), The Energy Eigen Functions (4.2), Properties of Stationary States (4.3), The Abstract Operator Method (4.4), Coherent States (4.5).

(a) Angular Momentum and Parity
The Angular momentum Operators (4.6),The Eigenvalue Equation for L^2 ; Separation of Variables (4.7), Admissibility Conditions on Solutions ; Eigenvalues (4.8), The Eigen Functions:Spherical Harmonics (4.9), Physical Interpretation (4.10), Parity (4.11), Angular Momentum in Stationary States of Systems with Spherical Symmetry (4.12), Solution of the Interior region (4.13)

Related Examples, Problems & Short Questions

Basic Reference: *A Textbook of Quantum Mechanics by P.M. Methews and K. Venkateshan, McGraw Hill. Education 2nd Edition*

Other References:
1. Quantum Mechanics by Ghatak and Loknathan, The Macmillan Company of India Limited.
2. Quantum Mechanics by Fschwabi, Narosa Publishing House, NewDelhi.
3. Quantum Mechanics by John, L. Powell and B.Crasemann.
4. Quantum Mechanics by Schiff

Learning Outcome:
After the successful completion of the course students will be able to understands,
- The numerical techniques for Legendre, Bessel, Hermite differential equation and can able to solve Leguerre, Legendre, Rodriguez's polynomials equations.
- The motion of rigid body and get knowledge of Lagrange's and Hemilton's Equations and applications of them.
- The physical interpretations of the energy-eigen functions, Properties of Stationary States and Coherent States and the Angular momentum operators.

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CBCS - Semester - Grading Pattern

B. Sc. Semester - VI

PHYSICS SYLLABUS (Effective from June-2022)

CC: PHY-602

STATISTICAL MECHANICS, SOLID STATE PHYSICS & OPTICS

Course Objectives:

- To give deep knowledge of Bose Einstein and Fermi Dirac Distribution.
- To provide deep knowledge of different partition function.
- To create awareness about Ideal gas system and Debye's Model of Solids: Phonon Gas.
- To provide knowledge of Superconductivity, Thermodynamic properties and BCS theory.
- To create knowledge in students about principle of Holography and its applications.
- To provide deep awareness about Fibre optics and Characteristics of the Fibres.

UNIT- I STATISTICAL MECHANICS

(a) B.E. and F.D. Distribution

Symmetry of Wave Function(8.1), The Quantum Distribution Functions(8.2), The Boltzman Limit of Boson And Fermion Gases(8.3), Evaluation of Partition Function(8.4), Partition Function For Diatomic Molecules(8.5), [(a)Translational-(b)Rotational-(c)Vibrational-(d) Electronic Partition Function (8.5-a,b,c,d)], Equation of State for an Ideal Gas(8.6), The Quantum Mechanical Paramagnetic Susceptibility(8.7), ***Related Examples, Problems & Short Questions***

(b) Ideal Bose System :

Photon Gas (9.1), Einsteen's Derivation of Planck's Law (9.2), Bose-Einstein Condensation (9.3), Specific Heat From Lattice Vibration (9.4), Debye's Model of Solids: Phonon Gas (9.5)

Basic Reference:*Fundamentals of Statistical Mechanics by B. B. Laud, NewAge Int.Publishers*

Other Reference :

1. Statistical Mechanics and Properties of Matter, by E.S.R.Gopal Pub. McMillan Co. of India Ltd.
2. Statistical Mechanics by B. K. Agarwal- Melvin Eisner. NewAge Int.Pub.

UNIT-II SOLID STATE PHYSICS

Superconductivity :

Phenomena without observable Quantization(15.1), Zero resistance and persistent currents(15.1.1), Perfect Diamagnetisms : Meissner Effect(15.1.2), London Equation (15.1.3), Critical Field : Type I and Type II super conductors (15.1.4), Thermodynamic properties (15.1.5), Energy gap (15.2), Properties Dependent on Energy gap (15.3), Heat Capacity (15.3.1), Thermal Conductivity (15.3.2), Absorption of Electromagnetic Radiation (15.3.3), Normal Tunnelling (15.3.4), Isotope Effect (15.4), BCS Theory : A

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qualitative approach (15.5), Cooper pair formation (15.5.1), BCS ground state (15.5.2), Important predictions of the BCS theory and comparison with experiments (15.6), Critical temperature (15.6.1), Ginzburg-Landau Theory (15.7), Magnetic flux Quantization (15.7.1), Coherence Length (15.7.2), Type-II superconductivity (15.7.3), Josephson tunneling (15.7.4), Applications(15.9).

Related Examples, Problems & Short Questions

Basic Reference: *Elements of Solid State Physics by J.P. Srivastava, PHI New Delhi 2006 (2nd Edition)*

Other Reference :

1. Solid State Physics by C. Kittel. John Willy and Sons.
2. Solid State Physics by Saxena. Pragati Prakashan.
3. Solid State Physics by C. M.Kachhawa.
4. Solid State Physics by S O Pillai

UNIT-III Holography and Fiber Optics

(a) Holography

Introduction (23.1), Principle of Holography (23.2), Recording of the hologram (23.2.1), Reconstruction of the image (23.1.2),coaxial holography (23.3), off-axis holography (23.4), Theory (23.5), Holograms (23.6), Orthoscopic and pseudoscopic images (23.6.1), Holography and Photography (23.6.2) Important properties of Hologram (23.7), Classification of holograms (23.8), Applications (23.9), Medical application (23.10)

(b) Fiber Optics

Introduction (24.1), Optical Fibre (24.2), Necessity of cladding(24.2.1),Optical Fibre System (24.2.2), Optical fiber cable (24.2.3), Total Internal Reflection (24.3), Propagation of Light Through and Optical Fibre (24.4),Critical angle of Propagation (24.4.1), Acceptance angle (24.4.2), Fraction of refractive index (24.5), Numerical aperture(24.6), Skip distance and number of total internal reflections (24.7), Classification of optical fibres (24.10), Types of Optical Fibre (24.11), (24.11.1, 24.11.2, 24.11.3), V-Number (Normalize frequency)(24.13), Losses in Optical Fibre (24.15), Attenuation (24.15.1), Bandwidth (24.17), Characteristics of the Fibres (24.18), Fibre Optic Communication System (24.21), Merits of Optical Fibres (24.22), Disadvantages (24.22.1).

Related Examples, Problems & Short Questions

Basic Reference: A Textbook of Optics by Dr.N.Subrahmanyam, Brijlal and Dr. M. N. Avadhanulu (as per UGC Model syllabus,25th revise addition 2012, reprint 2018) (S. Chand Co.)

Learning Outcome:

After the successful completion of the course students will be able to understands,

- Bose Einstein, Fermi Dirac Distribution and get knowledge of different partition function.
- The ideal gas system and Debye's model of solids. Also knows Type I and Type II super conductors as well as Meisner effect.
- About Superconductivity, Thermodynamic properties and BCS theory. Also aware about Josephson tunneling and its Applications.
- The principle of Holography and its applications. Also get awareness about Fibre optics and Characteristics of the Fibres.

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CBCS - Semester - Grading Pattern

B.Sc. Semester-VI

PHYSICS SYLLABUS (Effective from June 2022)

CC: PHY-603

ELECTRODYNAMICS & MOLECULAR SPECTRA

Course Objectives :

- To learn Laplace's equation in one, two and three dimensions for potentials.
- To learn Boundary conditions and uniqueness theorems and Also to aware about Cartesian and spherical co-ordinates.
- To Provide knowledge of electromagnetic induction and electromagnetic waves.
- To Provide a Raman effect understanding of Raman spectra and molecular spectra.
- To enable the students to study electronic spectra and deep knowledge of it.

UNIT- I ELECTROMAGNETICS

(a) Potentials :

Laplace's Equation (3.1), Introduction (3.1.1), Laplace's Equation in one dimensions (3.1.2), Laplace's Equation in two dimensions(3.1.3), Laplace's Equation in three dimensions (3.1.4), Boundary conditions and Uniqueness theorems (3.1.5),Conductors and the second Uniqueness theorem (3.1.6), The method of images (3.2), The classic image problem (3.2.1), Induced surface charge (3.2.2), Force and energy (3.2.3), other image problems (3.2.4) Separation of variables (3.3), Cartesian Coordinates (3.3.1), Spherical coordinates (3.3.2), Multipole Expansion (3.4), Approximate Potential at large distances (3.4.1), The monopole and dipole terms (3.4.2), Origin of Coordinates in multipole Expansions (3.4.3).

Related Examples, Problems & Short Questions

UNIT - II ELECTROMAGNETICS

(a) Electrodynamics : Electromagnetic Induction:

Electromagnetic induction(7.2), Faraday's law(7.2.1), The Induced Electric Field(7.2.2), Inductance(7.2.3), Energy in Magnetic field(7.2.4), Maxwell's Equation(7.3), Electrodynamics before Maxwell(7.3.1), How Maxwell fixed Ampere's Law(7.3.2), Maxwell's Equations(7.3.3), Magnetic charge(7.3.4), Maxwells equations in matter(7.3.5),

(b) Electromagnetic Waves :

Electromagnetic Waves in Vacuum (9.2), The Wave equation for E and B (9.2.1),Monochromatic plane waves (9.2.2), Energy and Momentum in Electromagnetic Waves (9.2.3), Electromagnetic Waves in Matter (9.3), Propagation in Linear Media (9.3.1), Reflection and transmission at normal

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incidence (9.3.2), Reflection and transmission at oblique incidence (9.3.3), Absorption and Dispersion: Electromagnetic Waves in conductors (9.4.1) **Potentials and fields:** The Potential Formulation : Scalar and Vector Potentials (10.1.1), Gauge Transformations (10.1.2), Coulomb Gauge and Lorentz Gauge(10.1.3)

Related Examples, Problems & Short Questions

Basic Reference: *Introduction to Electrodynamics by David J. Griffiths. 4th Edition Cambridge University press.*

Other Reference: Electromagnetics by B. B. Laud. Willley Eastern Ltd**.**

UNIT – III MOLECULAR SPECTRA

(a) Raman Spectra

Nature of the Raman Effect (20.1), Experimental Arrangement for Raman Spectra (20.2), Classical Theory of Raman Effect (20.3), Quantum theory of Raman Effect (20.4), Raman Spectra and Molecular Structure (20.5), Infra-red Spectra Versus Raman Spectra (20.6),

(b) Electronic Spectra

Salient Features of Molecular Electronic Spectra (21.1), Formation of Electronic Spectra (21.2), Vibrational (Gross) Structure of Electronic Band- System in Emission (21.3), Electronic Band Spectra in Absorption (21.4), Rotational Structure of Electronic Bands (21.5), Observed Intensity Distribution (Vibrational) in Band-Systems:Franck-Condon Principle(21.7), Quantum- Mechanical Formulations of Franck-Condon Principle (2.8), Explantation of Intensity Distribution in Absorption Bands from Franck-Condon Principle.

Basic Reference:
Atomic & Molecular-Spectra by RajKumar, KedarNath RamNath, Delhi. (2005)

OtherReferences:
1. Molecular spectroscopy by Herz-Berg.
2. Molecular spectroscopy by Banewell

Learning outcomes :

At the end of the course the students will be able to,

- Understand the Laplaces' equations.
- Understand the boundary conditions & Process of different co-ordinates.
- Learn electromagnetic induction as well as electromagnetic waves and potential formulation.
- Understand Raman effect with experimental arrangement for Raman spectra and molecular structure. Also understand electronic spectra.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-VI

PHYSICS SYLLABUS

CC: PHY-604
ELCTRONICS AND COMPUTER PROGRAMMING

Course objective :

- To Provide the basic knowledge of feedback, its principle and negative feedback
- To Learn deep knowledge of various transistor like tuned, Hartly - Colpiltt's oscillators Phase shift oscillator etc.
- To Provide Sufficient awareness of modulation and different concept, techniques of it.
- To give basic knowledge of digital electronics and process of Decoder, multiplexer and De multiplexer.
- To Provide basic knowledge of operators, expressions, Decision making and branching in Programming C.

UNIT – I

(a) Feedback Amplifier :

Feedback (8.1), Principle of Feedback Amplifiers (8.2), Advantages of Negative Feedback (8.3), Reasons for Negative Feedback (8.4 a,b,c,d), Negative feedback circuits (8.5).

Related Examples, Problems & Short Questions

(b) Transistor Oscillators (Sinusoidal):

Introduction to oscillators : Types, components and Barkhausen criterion,
Tuned Collector Oscillators(11.1), Tuned Emitter Oscillator(11.3), Tuned Base Oscillator(11.3), Hartley Oscillator (11.4), Colpitt's Oscillators (Circuit operation and alternative treatment only) (11.5), CLAPP Oscillator(11.6), Phase Shift oscillators (11.7), R-C- Oscillator (11.7.1), Wien Bridge Oscillator (11.7.2), Crystal Oscillator (11.8).

Related Examples, Problems & Short Questions

Basic Reference:

Hand Book of Electronics by Gupta and Kumar. ***(46th revised Edition 2019)***

UNIT – II

(a) Modulation :

Definition(20.1), Amplitude Modulation (20.2 A,B,C,D), Method of amplitude Modulation(20.3), Transistor Modulators(20.3.1-A,B,C,D,E), Square law Modulation(20.3.2-A,B), Double Sideband

Suppressed Carrier Modulation [DSBSC Modulation](20.4.1 A,B), Single Sideband Generation(20.4.2 A,B,C), Advantages and Disadvantages of the Single Sideband (SSB) Transmission(20.4.3), Vestigial Sideband Modulation(24.4.4), Independent Sideband System (ISB)(20.4.5), Frequency Modulation {characteristic and analysis of FM Wave- Frequency deviation, Power relation in FM Wave, Frequency Spectrum and Bandwidth of FM wave}(20.5), Reactance Method for Producing F.M. Wave(20.6), Comparison of Frequency and Amplitude Modulation(20.7), Phase modulation (20.8)

Related Examples, Problems & Short Questions

Basic Reference:

Hand Book of Electronics by Gupta and Kumar. ***(46th revised Edition 2019)***

(b) Digital Electronics:

Simplification using KARNAUGH Maps (18.10-Complete- 18.10.1,18.10.2,18.10.3), Simplification using QUINE-Mc CLUSKEY method(18.11 Complete-A,B), DON'T- CARE Conditions-Decoder /Encoder (18.12), BCD-to- 7 Segment Decoder (18.13), Digital Comparator (18.14), Multiplexer – Data Selector(18.15), Demultiplexer(18.16).

Related Examples, Problems & Short Questions

Basic Reference: *Hand Book of Electronics by Gupta and Kumar.* ***(46th revised Edition 2019)***

Other Reference:

1. Electronics and Radio Engineering by M. L. Gupta. 9th Enlarged Edition reprint 2002. Dhanpat Rai Publication Co.
2. Fundamental of Digital Circuits,by AnandKumar (Fourth Edition, PHI)
3. Electronic Devices and Circuits An Introduction by Allen Mottershead, PHI
4. Digital Principles and applications, D P Leach, A p Malvino, G Saha, Tata McGrawHill

UNIT - III Programming in C

(a) Operators and Expressions

Introduction (4.1), Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators (4.2 to 4.9), Arithmetic Expressions (4.10), Evolution of Expressions (4.11), Precedence of Arithmetic Operators (4.12), Some Computational Problems (4.13), Type Conversion in Expressions (4.14), Operator Precedence and Associatively (4.15), Mathematical Functions (4.16).

Related Examples, Problems & Short Questions

(b) Managing Input and Output Operations

Introduction (5.1), Reading a Character (5.2), Writing a Character(5.3), Formatted Input (5.4), Formatted Output (5.5)

Related Examples, Problems & Short Questions

(c) Decision making and branching

Introduction (61), Decision making with if statement (6.2), simple if statement (6.3), The if **. . . . .** else statement (6.4), Nesting of if**….**else statement (6.5), The else if ladder (6.6), The switch statement (6.7), The ? **:** Operator (6.8), The GOTO statement (6.9).

Related Examples, Problems & Short Questions

Basic Reference :

Programming in ANSI C **(Eighth Edition)** Mc Graw Hill Pub. E Balagurusamy.(Ch:4,5,6)

Learning Outcomes:

At the end of the Course students will be able to,

- Understand the basic concept of feedback & negative feedback
- Understand the operation of different oscillators and awareness of modulation within concept of techniques.
- Know digital electronic techniques and operation within it,
- Understand the programming in C with various aspect.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-VI

PHYSICS SYLLABUS

LABORATORY EXPERIMENTS

Course Objectives :

- To learn by performing the experiments based (i) based on principles and (ii) application of the theoritical course.
- To get knowledge of working of equipments like optical level, ketter's pendulum, G.M. Counter, Michelson interferometer and Lioyd's minor.
- To have sufficient knowledge of experiments related optics, electronics, electricity and also known electronic circuits.
- To learn the usage of electrical and optical system of different measurements.
- To have ability to solve problems using programming in 'C' language.

PC: PHY-601

1. Young Modulus 'y' by Koening method.
2. Optical Lever
3. Viscosity by Log decrement
4. Acceleration due to gravity (g) using Kater's pendulum(with **FIXED** knife edges)
5. G.M. Counter (Comparison of Intensities)

PC: PHY-602

1. To determine air gape '**t**' between two plates of F.P. Etalon and determination of wavelength' **λ** ' of monochromatic light
2. Temperature of Flame
3. Find the Flatness of glass Plate using Newton's Ring
4. To determine λ and dλ of sodium light using Michelson interferometer
5. Determination of wavelength of light by Lioyd's mirror.

PC: PHY-603

1. Mutual induction 'M' of two coil using B.G.
2. High resistance 'R' using leakage method
3. Maxwell's Bridge
4. Solenoid Inductor
5. Susceptibility of $FeCl_3$ using Quienk's method

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PC: PHY-604

1. A study of transistorized Collpit's oscillator using CRO / Wavemeter
2. Negative Feedback Amplifier
3. A study of Half subtractor and Full subtractor
4. To determine frequency of AFO using Wein bridge
5. Use of Computer- Programming in 'C' language.

(Only One experiment of C-language should be in Uni. Exam.)

Learning Outcomes :

At the end of the course the students will be able to understand,

- The basic principles of physics related to their courses in the practical way.
- The experiment and operational details of CRO, Optical level, MI, GM Counter etc.
- The various properties of young modulus, viscosity, wavelength, mutual induction, etc.
- How to analyze the experimental data and graphical analysis. And programming in 'C'.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

Elective (Subject) Courses for SEM **VI [Credits-2]**

(In force from June 2022)

ES : PHY-09 OPTOELECTRONIC INSTRUMENTS

Course Objectives:

- To aware Population inversion and metastable state in Laser, type of Laser and applications
- To gain knowledge of principle, construction, working process of FP Interferometer and Italon.
- To provide hands on experimental aspect to measurement of wavelength.
- To develop knowledge of Electron microscope and Fabry Parot Interferometer and usage of it.
- To learn the working function of EM and different focusing.

UNIT I

Introduction (22.1), Attenuation of light in optical medium (22.2), Thermal Equilibrium (22.3), Interaction of light with matter (22.4 -22.4.1 to 22.4.4), Einstein coefficients and their relations (22.5-22.5.1, 22.5.2), Light Amplification (22.6-22.6.1 to 22.6.2), Meeting the three requirements: Population inversion, Metastable states, Confining radiation within the medium (22.7 - 22.7.1 to 22.7.3), Components of LASER (22.8), Active medium (22.8.1), Pumping (22.8.2), Optical Resonant Cavity (22.8.3), Lasing Action(22.9), Thresold for Oscillation(22.9.1), Principal pumping schemes (22.10), (22.10.1 to 22.10.4), Role of resonant cavity(22.11), MODES of the LASER Beam: Longitudinal modes (22.12.1), Gain curve and laser operating frequencies (22.12.2), Transverse modes (22.15), Types of Lasers, Rubby Lasers, ND : Yag Laser, Helium-Neon Laser (22.14), Laser beam Characteristics(22.16), Applications(22.19).

Basic Reference: ***A Textbook of Optics by Dr. N. Subrahmanyam, Brijlal and Dr. M. N. Avadhanulu, S. Chand & Co. (Reprint 2018)***

UNIT-II Fabry - Parot Interferometer and Etalon (15.12)**,** Formation of fringes, Determination of wavelength, Measurement of difference in wavelength (15.12.1 to 15.12.3)

Electron Microscope: Principle, electrostatic focusing, magnetic focusing, description, use of electron microscope. (Page 204 to 213)

Basic references:

1. *A textbook of Optics by Dr. N.Subrahmanyam, Brijlal and Dr. M. N. Avadhanulu, S. Chand & Co. [For* **Fabry-Parot***]*
2. *Atomic Physics by J. B. Rajam, S. Chand & Co.(1960) [For Electron Microscope]*

Learning Outcome:

After the successful completion of the course students will be able to understands,

- The Population inversion and metastable state in Laser, type of Laser and applications.
- The principle, construction, working process of FP Interferometer and Italon.
- The experimental aspect to measurement of wavelength and have knowledge of Electron microscope and Fabry Parot Interferometer and usage of it.
- The working function of EM and different focusing.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: PHYSICS :: SEMESTER- VI [Credits-2]
(In force from June 2022)

ES : PHY-10: REMOTE SENSING AND TRANSDUCERS

Course objective

- To get deep knowledge of Remote sensing , its history, atmospheric effect and photo geometry.
- To aware about detector, types of optical sensor and applications of satellites.
- To learn about Transducer, classification of it and various types of transducer.

UNIT-I

Remote Sensing :

Introduction, Beginning of Remote Sensing in India, History, Electromagnetic energy, Visible and non-visible radiation, Emission of EM radiation, Atmospheric effect, Solar constant Remote Sensing-a developing Science: Atmospheric Window, Human vision and Human Eye, Useful instruments, Micro-resolution, Photo-geometry.

New Technology: Detectors, Optical Sensors, Types of Optical Sensors, Optical mechanical sensor, Scanning radiometer, IR Scanner, Multi-spectra Scanner. TV, Radar and Solar systems, Applications of RS in different fields –Land set satellites, Earth resource satellites.

Basic Reference:

1. Remote Sensing by Suresh Shah (in Gujarati) Uni. Granth Nirman Board, Ahmedabad.
2. Introduction to Optical Remote Sensing by P. S. Phisaroty (ISRO-Banglore).

UNIT-II

Transducers :

What is Transducers? , Classification of Transducers, Classification based on electrical principle involved, Resistive Position Transducers, Resistive Pressure Transducer, Linear Variable Differential Transducer, Piezoelectric Transducer, Strain gauze Transducer, Temperature Transducers, Resistance temperature Detector, Thermistor, Thermocouple, Various types of Microphones, Carbon microphones, Ribbon microphones, Loudspeaker, Moving coil microphones.

Basic Reference: Basic Electronics (solide state) by B. L. Tharaja , Pub. S. Chand & Compny (5^{th} Edition)

Learning Outcome:

After the successful completion of the course students will be able to understands,

- The Remote sensing, its history, atmospheric effect and photo geometry.
- The detector, types of optical sensor and applications of satellites.
- The Transducer, classification of it and various types of transducer.

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હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in Website : www.ngu.ac.in

પરિપત્ર ક્રમાંક – ૧૩૦ / ૨૦૨૨

વિષયઃ વિજ્ઞાન વિદ્યાશાખાના સ્નાતક કક્ષાના નવા અભ્યાસક્રમો અંગે...

આ યુનિવર્સિટી સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાએ કરેલ ભલામણ અનુસાર નીચેના વિષયોના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો **જૂન – ૨૦૨૨ થી ક્રમશઃ અમલ માં આવે તે રીતે** એકેડેમિક કાઉન્સિલએ તેની તા. ૧૨/૦૪/૨૦૨૨ ની સભા ના નિર્દિષ્ટ ઠરાવો થી મંજૂર કરેલ છે. જેનો અમલ કરવા સારૂ સંબંધિતોને આ સાથે મોકલવામાં આવે છે, જેનો ચુસ્ત અમલ થવા વિનંતી છે.

ક્રમનં.	અભ્યાસક્રમ	એકેડેમિક સભાના ઠરાવક્રમાંક	સેમેસ્ટર
૧	વનસ્પતિશાસ્ત્ર	૨૪	સેમ.–૫ અને ૬
૨	ગણિતશાસ્ત્ર	૨૬	સેમ.–૫ અને ૬
૩	ભૌતિકશાસ્ત્ર	૩૦	સેમ.–૫ અને ૬
૪	રસાયણશાસ્ત્ર	૫૩	સેમ.–૫ અને ૬

આ બાબતની સંબંધિત અધ્યાપકો તથા વિદ્યાર્થીઓને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

નોંધઃ (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજ ના ગ્રંથાલયમાં મૂકવાની રહેશે.
(૨) આ અભ્યાસક્રમ યુનિવર્સિટીની વેબ સાઈટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

સહી/–
અધ્યક્ષ
કા.કુલસચિવ

બિડાણઃ ઉપર મુજબ

નં.–એ કે / અ× સ / ૧૧૭૫ / ૨૦૨૧
તારીખ : ૦૧ / ૦૬ / ૨૦૨૨

પ્રતિ,

૧. અધ્યક્ષશ્રી/ કો.ઓર્ડીનેટરશ્રી –વિજ્ઞાન વિદ્યાશાખા અંતર્ગત અનુસ્નાતક વિભાગો, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૨. સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓ
૩. ડૉ. જગદીશ એચ. પ્રજાપતિ (ડીનશ્રી – વિજ્ઞાન વિદ્યાશાખા),સરકારી સાયન્સ કોલેજ, **થરાદ.** જિ. બનાસકાંઠા
૪. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (પાંચ નકલ)
૫. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)
૬. સીસ્ટમ એનાલીસ્ટ, કોમ્પ્યુટર(રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ. યુનિવર્સિટી,પાટણ તરફ વેબસાઈટ પર મૂકવા સારૂ.
૭. પ્રવેશ પ્રશાખા(એકેડેમિક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.
૮. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમ. ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ–પરિપત્રની ફાઈલ અર્થે
૯. સિલેકટ ફાઈલે– (૨ નકલ)

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Programme code :		Programme Name :	B.Sc.
Faculty :	SCIENCE	Semester :	VI
Subject :	CHEMISTRY		
Effective from :	June 2022 થી		

Sr.	Paper Code	Name of Paper	Credit
1	CC CH-601	INORGANIC CHEMISTRY-I	3
2	CC CH-602	ORGANIC CHEMISTRY-II	3
3	CC CH-603	PHYSICAL CHEMISTRY-III	3
4	CC CH-604	STRUCTURAL -ANALYTICAL CHEMISTRY-IV	3
5	SE CH -605 A	POLYMER CHEMISTRY	2
	SE CH -605 B	ELECTRO ANALYTICAL TECHNIQUES	
6	GE CH 606 A	ELECTIVE (GENEIC) COURSE	2
7	LC CH-607 A	LABORATORY COURSE-I INORGANIC CHEMISTRY PRACTICALS	1.5
	LC CH-607 B	LABORATORY COURSE-II ORGANIC CHEMISTRY PRACTICALS	1.5
	LC CH-607 C	LABORATORY COURSE-III PHYSICAL CHEMISTRY PRACTICALS	1.5
	LC CH-607 D	LABORATORY COURSE-IV VIVA -VOCE	1.5

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

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NAAC Accreditation Grade – "B"

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FACULTY OF SCIENCE

CHEMISTRY SYLLABUS

(Effective from June-2022)

B.Sc. (semester V & VI Programme)

The proposed new courses in chemistry for under graduate classes are reassigned in accordance to semester/CBCS/Grading system with new education policy. The new course is based on model curriculum of the university grants commission.

The medium of instruction should be Gujarati and the question paper should be drawn in Gujarati with the English version. Students are permitted to write answer in English or Gujarati language.

Its objective are as under:

1. To meet the growing demand of Specialization and Advanced Courses in applied science.
2. To help the colleges to update and modernize their laboratories.
3. To redesign the courses the special emphasis on local requirements, environment, to link the courses with requirements of the industries and research
4. To prepare for National level entrance test like NET/SLET/JRF and other competitive exams.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY
University Road, P.O.BOX NO: 21, PATAN-384265
N. Gujarat. INDIA.
NAAC Accreditation Grade – "B"
E-Mail: ngu_vc@wilnetonline.net
ngu_regi@wilnetonline.net
Website: www.ngu.ac.in
www.ngu patan.org

FACULTY OF SCIENCE
CHEMISTRY SYLLABUS
(Effective from June-2022)

Common Formula For Question Paper (Core course)

Time: 3 Hours **Total Marks:70**

Theory Examination Pattern(Core Course):

Que.No:1	A: Write any Two out of Three Questions	12 Marks
	B: Write any One out of Two Questions	05 Marks
Que.No:2	A: Write any Two out of Three Questions	12 Marks
	B: Write any One out of Two Questions	06 Marks
Que.No:3	A: Write any Two out of Three Questions	12 Marks
	B: Write any One out of Two Questions	05 Marks
Que.No:4	Write any Three Questions out of Five Questions. (Ask Questions from Unit-1,2 and 3 With Equal Sharing.)	18 Marks

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Hemchandracharya North Gujarat University, Patan

B. Sc. Chemistry

Semester : VI

Inorganic Chemistry

Paper : CC CH-601

UNIT :-1: Valency

- Variation method, Secular Equation, Stability of $H2^+$ ion; M.O. approach,Stability of H_2 molecule; V. B. approach, Classical interaction energy
- Representation of wave function for SP, SP^2 and SP^3 hybride orbitals, bond angle and bond strength
- M.O. treatment of Oh molecules
- Quantum mechanical representation of Pauli's exclusion principle

UNIT :- II : Metal Carbonyl

- Introduction
- Classification: Mononuclear and Polynuclear
- Physical and Chemical Properties
- Metal Carbonyl (M-CO) bonding (On the basis of V.B.T. and M.O.T.)
- Use of IR Spectra to determination of structure of metal carbonyl
- Structure of Metal Carbonyl
  $Ni(CO)_4$, $Fe(CO)_5$, $Cr(CO)_6$, $Fe_2(CO)_9$, $Co_2(CO)_8$, $Mn_2(CO)_{10}$, $Fe_3(CO)_{12}$
- Calculation of EAN of metal atom in metal carbonyl
- Metal Nitrosyl complexes: - Bonding in metal nitrosyl
- Classification of metal Nitrosyl

UNIT :- III : Bio-Inorganic Chemistry

- Introduction,
- Essential elements,
- Trace elements
- Metal porphyrine,
- Study of hemoglobin and myoglobin
- Nitrogen fixation: In Vivo and In Vitro

Books Suggested (Inorganic Chemistry)

1. Valance and molecular structure by Cartmell and Flower.
2. Text book of Inorganic Chemistry by Durent and Durent.
3. Inorganic Chemistry by S. Chand.
4. Advance Inorganic Chemistry Vol-Il Satya Prakash (S.Chand)
5. Concise Inorganic chemistry by J.D.Lee.
6. Metalic Corrosion By M.N. Desai
7. Advance Inorganic Chemistry J.E. Huhee

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B. Sc. Chemistry

Semester : VI

Organic Chemistry

Paper : CC CH-602

UNIT :-1: Electrophillic and Free radical addition reactions

- Addition to carbon carbon double bond
- Mechanism for addition of halogens
- Reactivity order of Alkene on electrophilic addition reactions
- Stereo selective and stereo specific reaction of alkene
- Markovnikov's rule
- Addition reaction of H_2O and H_2SO_4 in alkene
- Rearrangement, Dimerization and Alkylation in electrophilic addition reactions
- Peroxide effect (Anti markovnikov's rule)
- Free radical addition, mechanism of peroxide initiated addition of HBr
- Syn and Anti addition reactions
- Electrophillic addition to conjugated dienes (1:2 v/s 1: 4 addition)
- Free radical addition to conjugated dienes

UNIT :-II : Active Methylene Group Compounds

- Introduction of Tautomerism
- Determination of keto-enol tautomerism
- Differences between Tautomerism and resonance
- Synthesis and application of Ethyl aceto acetate and malonic ester

UNIT :- III : Nucleophillic Aromatic Substitutions

- Nucleophilic aromatic substitution [Bimolecular displacement (SN^2) mechanism]
- Elimination - Addition mechanism via benzyne
- Stability and properties of benzyne
- Evidences of Benzyne intermediate

Books Suggested (Organic Chemistry):

1. Organic chemistry by Morrison & Boyd Vth Edition
2. Advance organic chemistry by R.K.Bansal.
3. Organic chemistry by I.L.Finar Voll &. Il Vth Edition.
4. Organic chemistry by pine, Hendrikson, Cram and Hammond IVth edition...
5. Outline of chemical technology by Dryden IInd Edition
6. Synthetic organic chemistry by Gurdeep R Chatwal.

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7. Advanced organic chemistry by Jerry March.
8. Organic reactions and their mechanisms IInd edition by P.S. Kalsi.
9. Organic chemistry of natural product Vol: I & II by Gurdeep R. Chatwal.
10. Advanced organic chemistry by Arun Bahal and B.S. Bahal.
11. Organic chemistry Vol, I, II, III by S.M.Mukherjee , S.P.Singh , R.P.Kapoor.
12. Advanced Organic Chemistry by L.D.S. Yadav & Jagdambasingh, Pragati prakashan

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B. Sc. Chemistry

Semester : VI

Physical Chemistry

Paper : CC CH-603

UNIT- I : Statistical Thermodynamics

- Introduction
- Combination and permutation
- Probability
- Sterling approximate formula (No Derivation)
- Langrage's undeterminated Constant
- Type of Statistics
  - Maxwell-Boltzmann
  - Bose-Einstine Statistics
  - Fermi-Dirac Statistics
- Partition Function
  - Transnational Partition function
  - Rotational Partition function
  - Vibrantional Partition function
- Numericals

UNIT :- II : Photochemistry

- Introduction
- Difference between Thermal and Photochemical reaction
- The Law of Absorption, Lambert-Beer law
- Laws of Photochemistry,
  (1) Grotthuss-Draper law (2) Stark- Einstein law and it's devation
- Quantum Efficiency or Quantum Yield
- Experimental determination of Quantum yield
- Reason of high and low Quantum yield
- The Jablonski diagram
- Types of Photochemical reaction
  (1) Photosensitized reaction (2) Photochemical equilibrium
- Qualitative description of fluorescence, phosphorescence and chemiluminescence.
- Flash Photolysis
- Numerical

UNIT :- III : Chemical Kinetics

- Effect of temperature on rate of reaction (Arhaneous equation)
- Concept of Activation energy
- Theories of reaction rate
  (1) Collision theory
  (2) Transition state theory

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- Comparison of collision and transition state theory
- Theories of Unimolecular reaction
- Lindemann's theory
- Trimolecular reaction
- Trautz's Law
- Primary salt effect
- Secondary salt effect
- Numerical

Books Suggested (Physical Chemistry) :

1. Advance Physical Chemistry by Gurdeep Raj.
2. Physical Chemistry (Question and Answer) by R. N. Madan, G.D. Tuli, S.Chand.
3. Principal of Physical Chemistry by Puri, Sharma, Pathania.
4. Chemical Thermodynamics by R.P. Rastogi and R.R. Mishra.
5. Physical chemistry by atkins.
6. Essentials of Physical Chemistry by B. S. Bahal, Arun Bahal, G.D.Tuli,
7. Physical Chemistry by P.W. Atkins, 5th edn, Oxford 1994 7th edn-2002.
8. Physical Chemistry by R.A. Albern and R.J.Silby, John Wiley 1995.
9. Physical Chemistry by G.H. Barrow, 5th edn, Mac Graw Hill, 1988,6th edn,1996.
10. Physical Chemistry by W.J.Moore, 4th edn, Orient Longmans 1969

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B. Sc. Chemistry
Semester : VI
Structural - Analytical Chemistry
Paper : CC CH-604

UNIT :-1: Term symbol & spectra of d'-do Octahedral complexes

(A) Term Symbol

- LS coupling
- JJ coupling
- Determination of ground state term by hund's rules
- Determination of term symbol for all state for p^2 & d^2 configuration by pigeon hole diagram

(B) Spectra of d^1 & d^9 octahedral complexes

- Selection rules & intensities transitions
- Oral diagram for d^1-d^9, d^2-d^8, d^3-d^7, d^4-d^6 octahedral & tetrahedral complexes explanation of d^1 & d^9 spectra(only introduction-no application)

UNIT :-11: IR spectra & Numericals based on UV, IR and NMR Spectra

(A) **Infrared spectroscopy**.

- Introduction
- Molecular vibrations (Fundamental vibrations of AX_2 type molecules)
- Characteristics of IR spectroscopy
- Sample techniques • Fingerprint region
- Effect of IR in geometrical isomerism
- IR spectra & H-bonding • Factor affecting on >C=O group frequencies
- Differentiate two compounds by the IR frequencies.

(B) Problems pertaining to the structure elucidation of organic compounds using UV, IR & NMR spectroscopic Data

UNIT :- III: Chromatography

- Introduction
- Classification of chromatographic techniques
- Column chromatography
- Paper chromatography
- Thin layer chromatography
- lon exchange chromatography
- Gas chromatography : Principle, Plate theory and Rate theory (only introduction)
- Application of chromatographic Techniques

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Suggested books: (structural chemistry)

1. Chemical application of group theory by F.A.Cotton
2. Chemical bonding and introduction by K.C.Patel, R.D.Patel and Raval
3. Application of group theory to chemistry by Bhattacharya
4. Symmetry in chemistry by Jafle and Orchin
5. Advance inorganic chemistry by cotton & Wilkinson
6. Basic principles of spectroscopy by R.Chand
7. Organic chemistry Vol. 1 by S.M.Mukherji, S.P.Shingh, Kapoor
8. Spectroscopy organic compounds VIth edition by P.S.kalsi
9. Organic chemistry by Morrison and Boyd
10. Spectrometric identification of organic compounds IVth edition by Silverstain, Bassler and Morrill.
11. Application of absorption spectroscopy of organic compounds by John R. Dyer
12. Spectroscopic method in organic chemistry Vth edition by Dudley H. Williams & lan Fleming
13. Physical methods for chemist Ruwssell S. Drago
14. Organic spectroscopy by Williams & Kemp
15. Organic spectroscopy by V.R.Dani
16. Qualitative Analysis R.A.Day & A.L.Underwood
17. Analytical Chemistry G.D. Christain
18. Fundamentals of Analytical Chemistry D.A.Skoog, D.M. West & F.J.Holler
19. Principales of Analytical Chemistry J.H. Kennedy
20. Analytical Chemistry – Principals & Techniques L.G.Hargis

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B. Sc. Chemistry
Semester : VI
Polymer Chemistry
Paper : SE CH-605 A

UNIT:-1: Polymers – 1

- Introduction
- Classification and Nomenclature of polymers
- Isomerism of polymers
- Chain growth polymerization - Introduction
- Mechanism of free-radical, Cationic and Anionic polymerization
- Kinetics of free radical, Cationic and Anionic polymerization
- Mechanism and Kinetics polycondensation

UNIT:- II : Polymers - 2

- Polymerization Techniques
- Concept of Averages
  -Number average molecular weight
  - Weight average molecular weight
  - Viscosity average molecular weight
- Molecular weight and Degree of polymerization
- Poly dispersity and molecular weight distribution
- Methods for determination of molecular weight
- Membrane Osmometry, Viscometry and Light Scattering

Reference Books:

1. Principles of polymers Science by P.Bahadur and N.V.Sastry.(Second Edition)
2. Polymer Science by V.R. Gowariker, N.V.Vashwanathan and Jaydev Shreedhar.

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B. Sc. Chemistry
Semester : VI

Electro Analytical Techniques
Paper : SE CH-605 B

Unit-1

- **Potentiometry-** The scope of potentiometric titrations, Precipitation and neutralization titrations, Graphical method including Gran's plot for selecting end point, Differential titration, Dead stop titration, Ion selective Electrode, various types of Ion selective Electrodes and applications of Ion selective electrodes,
- **pHmetry-** Introduction, types of indicator electrodes and reference electrodes
- **Conductimetry**- Introduction, types of conductance, effect of dilution, conductivity cells, types of titration.

Unit-2

- **Polarography:** Introduction, Principle, electrode, Types of currents, Determination of half wave potential, Ilkovic equation, methods of determining concentration (Standard addition method and Calibration method), Applications of Polarography.

Reference Books:

(1) Analytical Chemistry: Gary D. Christian, 6th Edition; Wiley & Sons
(2) Fundamentals of Analytical Chemistry: D. A. Skoog, D. M. West and F. J. Holler, 9th Edition, Cengage Learning.
(3) Instrumental Methods of analysis: (CBS) H.H . Willard, L.L. Mirrit, J.A. Dean
(4) Instrumental Methods of Inorganic Analysis: A.I. Vogel, ELBS
(5) The principals of ion-selective electrodes and membrane transport: W.E.Morf Principles of Instrumental Analysis: Douglas A. Skoog., F. James Holler, Stanley R. Crouch, Cengage Learning; 6th Edition.

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B. Sc. Chemistry

Semester : VI

Laboratory Course

LC CH-607

(Inorganic, Organic, Physical Chemistry)

Inorganic Chemistry practical

Qualitative analysis (Minimum 10)

Inorganic mixture should be comprised of six radicals.

Candidate if required should be guided once for the wrong group and marks deducted for wrong group. Maximum of five marks can be deducted for wrong group. There shell be no deduction of marks for reporting wrong radicals

Organic Chemistry practical

(A) Estimation of functional groups:

(1) Estimation of Amide

(2) Estimation of Ascorbic acid

(3) Estimation of Aspirin

(B) Synthesis of Organic Compounds

(1) Preparation of m-Dinitro benzene from Nitrobenzene

(2) Preparation of p-Nitro acetanilide from Acetanilide

(3) Preparation of Acetanilide from Aniline

(4) Preparation of Aspirine from Salicylic acid

(5) Preparation of Di-benzal acetone from Benzaldehyde

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Physical Chemistry

[Instruments): (Minimum 05)

(1) To Determine the Normality and Amount of each Base in given mixture of XN ($NaOH + NH_4OH$) by pH metric Titration using 0.1 N HCl.

(2) To Determine the normality and amount of KI in given solution of XN KI by Potentiometry titration using 0.1 N KMnO4.

(3) To Determine the formal Redox potential of Fe^{+2}/Fe^{+3} system by Potentiometry titration.

(4) To Determine the Normality and Amount of each Base in given mixture of XN ($NaOH+NH_4OH$) by Conductometry Titration using 0.1 N HCl..

(5) Determine the concentration of Cu^{+2} ions and CO^{+2} ions in in a given mixture of ($CuSO_4\,5H_2O + COCl_2\,6H_2O$).

(6) To Determine the amount of Nitrite in the given unknown Solution by Colorimetric method.

[B] Kinetics, Adsorption & Polymer

(7) To Study the Influence of Ionic Strength on Rate of Reaction between $K_2S_2O_8$ and KI.

(8) To Study the reaction between $KBrO_3$ and KI at two different Temperature and Calculate the Temperature Coefficient and Energy of Activation.

(9) To Study the Distribution of Benzoic Acid between Benzene and water at Room Temperature and Prove the Dimerization of Benzoic acid in Benzene.

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B. Sc. Chemistry

Semester : VI

Pattern of University Practical Exam

Time: 11:00am to 5:30pm (Including 30 minutes recess) **Total Marks: 200**

First Day

(A) Inorganic (50 marks)

- Inorganic Qualitative Mixture

(B) Organic (50 marks)

- Estimation (25 Marks) & Preparation (25 Marks)

Second Day

(C) Physical (50 marks)

- Any one exercise should be selected for each candidate from syllabus.

(D) Viva-Voce and Journal

- **Viva-Voce on practical base (40 marks)**
  - **Inorganic ..... 13 marks**
  - **Organic ..... 13 marks**
  - **Physical ..... 14 marks**

- **Journal (10 marks)**

➢ **Note: Without Certified practical record a student will not be permitted to appear at practical examination.**

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Hemchandracharya North Gujarat University, Patan

B. Sc. Chemistry

Semester : VI

Suggested batch distribution for practical exam

First Day:

11:00am to 2:00pm	2:30pm to 5:30pm
Inorganic: A Organic: B Physical: C	Inorganic: B Organic: C Physical: A

Second Day :

11:00am to 2:00pm	2:30pm to 5:30pm
Inorganic: C Organic: A Physical: B	Inorganic viva- All students (A,B & C batch) Organic viva- All students (A,B & C batch) Physical viva- All students (A,B & C batch)

Batch distribution (for 30 students and 3 Examiners)

[Maximu 10 Students per each Examiner]

Best wishes

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Hemchandracharya
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હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in Website : www.ngu.ac.in

પરિપત્ર ક્રમાંક – ૧૩૦ / ૨૦૨૨

વિષયઃ વિજ્ઞાન વિદ્યાશાખાના સ્નાતક કક્ષાના નવા અભ્યાસક્રમો અંગે...

આ યુનિવર્સિટી સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાએ કરેલ ભલામણ અનુસાર નીચેના વિષયોના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો **જૂન – ૨૦૨૨ થી ક્રમશઃ અમલ માં આવે તે રીતે** એકેડેમિક કાઉન્સિલએ તેની તા. ૧૨/૦૪/૨૦૨૨ ની સભા ના નિર્દિષ્ટ ઠરાવો થી મંજૂર કરેલ છે. જેનો અમલ કરવા સારૂ સંબંધિતોને આ સાથે મોકલવામાં આવે છે, જેનો ચુસ્ત અમલ થવા વિનંતી છે.

ક્રમનં.	અભ્યાસક્રમ	એકેડેમિક સભાના ઠરાવક્રમાંક	સેમેસ્ટર
૧	વનસ્પતિશાસ્ત્ર	૨૪	સેમ.–૫ અને ૬
૨	ગણિતશાસ્ત્ર	૨૬	સેમ.–૫ અને ૬
૩	ભૌતિકશાસ્ત્ર	૩૦	સેમ.–૫ અને ૬
૪	રસાયણશાસ્ત્ર	૫૩	સેમ.–૫ અને ૬

આ બાબતની સંબંધિત અધ્યાપકો તથા વિદ્યાર્થીઓને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

નોંધઃ (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજ ના ગ્રંથાલયમાં મૂકવાની રહેશે.
(૨) આ અભ્યાસક્રમ યુનિવર્સિટીની વેબ સાઈટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

સહી/–
અધ્યક્ષ
કા.કુલસચિવ

બિડાણઃ ઉપર મુજબ

નં.–એ કે / અ× સ / ૧૧૭૫ / ૨૦૨૧
તારીખ : ૦૧ / ૦૬ / ૨૦૨૨

પ્રતિ,

૧. અધ્યક્ષશ્રી/ કો.ઓર્ડીનેટરશ્રી –વિજ્ઞાન વિદ્યાશાખા અંતર્ગત અનુસ્નાતક વિભાગો, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૨. સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓ
૩. ડૉ. જગદીશ એચ. પ્રજાપતિ (ડીનશ્રી – વિજ્ઞાન વિદ્યાશાખા),સરકારી સાયન્સ કોલેજ, **થરાદ.** જિ. બનાસકાંઠા
૪. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (પાંચ નકલ)
૫. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)
૬. સીસ્ટમ એનાલીસ્ટ, કોમ્પ્યુટર(રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ. યુનિવર્સિટી,પાટણ તરફ વેબસાઈટ પર મૂકવા સારૂ.
૭. પ્રવેશ પ્રશાખા(એકેડેમિક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.
૮. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમ. ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ–પરિપત્રની ફાઈલ અર્થે
૯. સિલેકટ ફાઈલે– (૨ નકલ)

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

PATAN- 384 265

Modified Detailed Syllabus of CBCS PROGRAMME Pattern for B Sc Mathematics Semester System

With Effect from June: 2022

FACULTY	:	SCIENCE
SUBJECT	:	MATHEMATICS
CLASS	:	Bachelor of Science.
SEMESTER	:	V to VI
TOTAL PAGES	:	01 TO 20 (WITH COURSE STRUCTURE)
DATE	:	June 22, 2022.

I/c. Registrar
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North Gujarat University
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B.Sc. in Mathematics: PROGRAMME Structure under CBCS

With Effect from June: 2022

Hemchandracharya North Gujarat University, Patan-384265.

Mission: Our mission is to provide opportunities for developing basic-quality mathematical skills and achievement for their betterment of life through scientific and technological development.

Learning outcomes: Four major focusing areas: Logical Reasoning & Motivation; Analysis & Problem solving; Information & Technology Proficiency.

Vision: To Motivate Individuals to excel in the mathematical basic knowledge-driven environment of the 21st century through curriculum and train integrally human resources through teaching. We **Focus** on quality education.

(1) EDUCATIONAL AIMS:

Mathematics is one of the fundamental disciplines in science. It is the basic for all the disciplines. To make education more effective and learner centric, restructurisation of curriculum becomes essential. As a positive step in this direction and in order to respond to the emerging trends in the global scenario, it is decided to introduce the Choice Based Credit System (CBCS) from the academic year 2011-12 and modified it after three years. Under this system, the academic programme becomes student-oriented, relevant, interdisciplinary and flexible.

(2) CONDITIONS FOR ADMISSION :

A candidate who has passed the H Sec-Science Degree examination of the state or any other examinations accepted by the Syndicate as equivalent thereto shall be eligible for admission to this B Sc Programme in Mathematics on full-time basis of study.

INTAKE rules for admission are as per University notification from time to time.

Students are allowed to take admissions to successive semesters under carry over benefit facility as per the norm decided by the university .

(3) *LEARNING OUTCOMES :*

The programme leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding in the following areas:

- **Knowledge and understanding :** When one has completed this degree he/she will have knowledge and understanding of the fundamental concepts, principles and techniques from a range of topic areas.
- **Cognitive skills :** When one has completed this degree he/she will be able to understand how to solve some problems using the methods taught and develop abstract mathematical thinking .
- **Practical skills :** When one has completed this degree, he/she will be able to demonstrate the Communicate clearly knowledge, ideas and conclusions about mathematics and improve his/her own learning and performance.

(4) DURATION OF THE COURSE:

The CBCS pattern B. Sc. programme with multidisciplinary approach in Mathematics is offered on a full-time basis. The duration of the course is of three academic years consisting of six semesters each of 15 weeks duration.

(5) TEACHING, LEARNING METHODS :

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All relevant material is provided and taught in the course texts and through the study of set books. One will build up knowledge gradually, with sufficient in-text examples to support one's understanding. He/She will be able to assess his/her own progress and understanding by using the in-text problems and exercises at the end of each unit in form of practical using computer in computer laboratory.

(6) COURSE OF STUDY :

The curriculum has five major components:

1. *Principle/Core Courses (CC MAT)*
2. *Practical courses (PC MAT)*
3. *Elective Opt. Disciplinary courses (ES MAT)*
4. *Elective Generic course*
5. *Foundation Course*

There are at least 144 Credit COURSEs prescribed in the above classification as per the university norms to be studied to acquire B.Sc. Degree in Mathematics.

⇛ COURSE STRUCTURE ☒

Course	Courses	Credit /course	Teaching Hrs Total	Total Credits	Examination Internal	Hours	External	Total Marks
SEMESTER-I								
Principle/Core Courses: CC-MAT-111	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-111	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –11 Set Theory & Functions	1	2	2	2	15	2	35	50
Elective Generic	1	2	2	2	15	2	35	50
Foundation Course	1	2	2	2	15	2	35	50
SEMESTER-II								
Principle/Core Courses: CC-MAT-122	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-122	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ESMAT –21 Industrial Mathematics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	50	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-III								
Principle/Core Courses: CC-MAT-301	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-302	1	3	3	3	30	2.5	70	100

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Practical /PC- MAT-301	1	1.5	3	1.5	-	5	50	50
Practical /PC -MAT-302	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –31 Numerical Solution of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-IV								
Principle/Core Courses: CC-MAT-401	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-402	1	3	3	3	30	2.5	70	100
Practical/ PC- MAT-401	1	1.5	3	1.5	-	5	50	50

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Practical/ PC MATH-402	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –41 Improper Intrgrals	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-V								
Principle/Core Courses: CC-MAT-501	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-502	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-503	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-504	1	3	3	3	30	2.5	70	100
Practical/PC MAT-501	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-502	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-503	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-504	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ESMAT –51 Theory of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-VI								
Principle/Core Courses: CC-MAT-601	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-602	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-603	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-604	1	3	3	3	30	2.5	70	100
Practical/PC MAT-601	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-602	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-603	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-604	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –61 Business Statistics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50

N.B. : *Work-load depends on the number of students and the number of Batches/Groups , for Practical and Cognitive-skill based Course.*

As the *CBCS has a high probability to be operationalised efficiently and effectively for the elevating learners* , the Essential Requirements for all Mathematical Practical including MATLAB / PYTYHON / SCILAB practicals of Mathematical subjects are as under:

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1. Mathematical Laboratory inbuilt with sufficient number of Computers (as per the students enrollments and the number of practical batches) and MATLAB / PYTYHON / SCILAB SOFTWARE with basic requirements for the Practicals.

2. Mathematical Laboratory inbuilt with Graphs, Charts, Printer, Physical Models (two dimensional as well as three dimensional) & Virtual Models (Higher Dimensional – Computerized) and basic requirements for the same.

3. *Essential Requirement for Mathematical Computer Laboratory:*

   At least One full time Computer Operator and one Peon for computer laboratory having mathematical ability to run MATLAB / PYTYHON / SCILAB Software and related Computerized Mathematical practicals.

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B.Sc. (Mathematics) Semester-6

CC MAT—601 Abstract Algebra

UNIT-01:
Definition of a Ring and its applications, Elementary Properties of a Ring, Zero divisors and Integral domain, Characteristic of an Integral Domain, Solution of the equation ax = b in a ring R, Subring and its theorems and examples, Ideals and its properties.

UNIT-02 :
Introduction of Polynomials, Integral Domain D[x], Unique factorization of Polynomials, Division Algorithm for Polynomials, Solutions of a Polynomial Equation, Eisenstein Criterion for irreducibility, Gauss Lemma.

UNIT-03:
Formation of a Quotient ring and its properties, Homomorphism of rings, Maximal Ideal, Prime Ideal.

The course is covered by the Book : **I H Sheth, Abstarct Algebra**, Prentice Hall of India (PHI) Publication. Chapter 13(13.1 to 13.4), Chapter 14(14.1 to 14.4), Chapter 15(15.1 to 15.4), Chapter 16(16.1 to 16.3), Chapter 18(18.1 to 18.7), Chapter 19(19.1 to 19.4),

- **Reference books :**

1. I N Herstein, Topics in Algebra, Wiley Eastern Ltd.
2. N. Jacobson, Basic Algebra Vol I & II, Hindustan Publishing company
3. Shanti Narayan, A text book of Modern Algebra, S.Chand & Co.
4. P.B.Bhattacharya, S.K.Jain, S R Nagpal, Basics Abstract Algebra, (second Edition), Cambridge University Press.
5. N.S. Gopalkrishna, University Algebra, Wiley Eastern, New Delhi
6. Maclane Saunders and Birkhoff Garrett, Algebra, MacMillan, New York.
7. G.F.Simmons, Introduction to Topology and Modern Analysis, MacGrawHill Inc., U.S.A.

CC MAT -602 Mathematical Analysis-II

Unit-01 Limits and Continuity:
Limits and Continuity for a functions from a metric space into another metric space, continuity of a composite function, Structural properties of continuous functions from a metric space in to Rk, Continuity and Compactness, Continuity and connectedness.

Differentiation: Derivatives of a real function, Continuity and differentiability, Structural properties of the class of differentiable functions, Mean value theorems, Continuity of derivatives, L'Hospital rule.

Unit-02 The Riemann – Stieltje's Integral:
Riemann integral and Stieltje's integral,properties of Riemann integral and Stieltje's integral, Integration and Differentiation, Integration of Vector Valued Functions.

Unit-03 Sequences and Series of functions:
Sequences of functions, Limit of a Sequence of functions, Uniform convergence, tests for uniform convergence and continuity, Uniform convergence and differentiation.

The course is roughly covered by Chapters - 4,5,6,7 (Omit 5.16 to 5.20 and 7.28 to 7.33) of The book entitled **"Principles of Mathematical Analysis"** by Walter Rudin, McGraw Hill (International Student Edition), 3rd Edition.

- **Reference books:**

1. "A First Course in Mathematical Analysis" by D. Somasundaram & B. Choudhary, Narosa Publishing House.
2. "Fundamentals of Mathematical Analysis" by G. Das & S. Pattnayak Tata Mcgraw Hill Pub.Co.
3. "Fundamental of Real Analysis" by S. L. Gupta & Nisha Rani – Vikas Pub. House Pvt. Ltd. New Delhi-1974.
4. "Principle of Real Analysis "by S.C.Malik , Wiley Eastern Limited New Delhi 1982.
5. "Principle of Mathematical Analysis" by T.M.Apostol

CC MAT -603 A: General TOPOLOGY

Unit-01:
Toplology and topological spaces, Neighbourhoods, Hausdorff space, Closure of a subset of a topological space.

Unit-02:
Interior of a subset of topological space , Boundary of a subset of a topological space, Continuity of a function from topological space to topological space, Hoeomomorphism between two topological spaces.

Unit-03:
Subspace of a topological space, Connectedness of a topological spaces, Some applications of connectedness, Components of a point of connected topologicalspace.

Text-Book: **An Introduction to topology, by. Bert Mendelson(third addition)**
Ch.No.-3 : 2.1 to 2.4, 3.1, 3.3 , 3.7, 4.2 to 4.15 , 5.1to 5.7 , 5.9 , 6.1 to 6.3 , 6.5 to 6.8
Ch.No.-4 : 2.1 to 2.7 , 4.1 to 4.3 , 5.1 to 5.7

- **REFERENCE BOOKS:**

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1. Introduction to Topology and Modern Analysis, by. “G F Symmons”., New York McGrawHill, 1963
2. General Topology by Kelly J L , NewYork, Van Nostrand 1955
3. Elementary Topology by Beackett D W., New York Academic press, 1967

CC MAT 603 B: Number Theory

Unit-01:

Some Preliminary Consideration: Well-Ordering Principle, Mathematical Induction,the Binomial Theorem & binomial coefficients.

Divisibility Theory: the division algorithm, divisor, remainder, prime, relatively prime, the greatest common divisor, the Euclidean algorithm (Without proof), the least common multiple, the linear Diophantine equation & its solution.

Unit-02:

Prime Numbers: Prime and composite number, the Fundamental Theorem of Arithmetic (without proof), canonical form of a number, the Sieve of Eratosthenes.

Theory of Congruence: Definition and basic properties of congruence, Residue class &complete system of residues, special divisibility test, linear congruence, Chinese Remainder Theorem. (without proof)

Unit-03:

Fermat’s Theorem: Fermat’s Factorization method, Fermat’s little theorem, Wilson theorem, Euler’s theorem: Euler’s Phi-function $\phi(n)$ and formula for $\phi(n)$, Euler’s theorem (without proof) and only problems on Euler’s theorem.

- **Text Book:**

  Elementary Number Theory - David M. Burton, Sixth Edition, Universal Book stall, New Delhi. [(Chapter 1): 1.1 and 1.2 2) 2.1 to 2.4 3) 3.1 and 3.2 4) 4.1 to 4.3 5) 5.2 and 5.3 7) 7.2 and 7.3]

- **Reference Books:**

1. An introduction to the Theory of numbers - Niven and Zuckerman, Wiley Eastern Ltd.
2. Number Theory - S. G. Telang, Tata Mc Graw-Hill Publishing Company Limited, New Delhi
3. Elementary Theory of Numbers - C. Y. Hsiung, Allied Publishers Ltd.-India, ISBN 81-7023-464-6.
4. Number Theory - George E. Andrews, Hindustan Publishing Corporation- Delhi.
5. Elementary Number Theory - Gareth A. Jones & J. Mary Jones, Springer Verlag, ISBN 81- 8128-278-7.
6. Number Theory - J. Hunter, Oliver and Boyd-London.
7. Beginning Number Theory - Neville Robbins, Narosa Pub. House -New Delhi ISBN 978-81-7319-836
8. Introduction to the theory of Numbers - G. H. Hardy & E. M. Wright, Oxford Uni. Press
9. Higher Algebra - S. Barnard & J. M. Child, Macmillan India Ltd
10. Elements of Number Theory - I. M. Vinogradov , Dover Pub INC

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11. Elementary Number Theory in Nine chapters - James J. Tattersall, Cambridge Uni Press
12. A first course in Theory of Numbers - K. C. Chowdhary, Asian Books Pvt Ltd New Delhi
13. 1001 problems in Classical Number Theory - Jean Marie De Konick Armed Mercier, AMS
14. Number theory by Gurmeet Singh & Narinder Kaur, Pragati Prakashan, Meerut.

CC MAT-604 A: GRAPH THEORY

UNIT-01:

Graphs, Basic Definitions, Undirected Graphs, Mixed Weighted Graphs, Incidence and Degree, Bipartite Graph and Bipartition, Regular and K-regular Graph, Graph Isomorphisms, Sub Graphs,Graph Operations, Walk, Trail, Paths, Circuits.

UNIT-02:

Connected Graph, Disconnected Graph, Eccentricity, Radius and Diameter, Adjacency Strong ,Weak and Unilateral Components, Eular Graphs, Hamilton Paths, Trees, Binary Trees And m-array Tree, Spanning Trees.

UNIT-03:

Cut set, Internaly Disjoint Paths, Connectivity and Separability, Planar Graphs and their different Representation, Detection of Planarity, Geometric and Combinatorial duals, Vector Space Associated With a Graph, Circuit and Cut set Subspaces, Orthogonal Vectors And spaces.

- **REFERENCE BOOKS :**

1. A first look at Graph theory by John Clark and Derek Allan Holton.
2. An Introduction To Discrete Mathematics, Udayan M.Prajapati Dr.Ajay S. Gor, Nirav Prakashan
3. Graph Theory with Applications to Engineering and Computer Science by Narsing Deo
4. Graph Theory by Harary F.
5. Graph Theory and its applications by B. Harris
6. Discrete Mathematical Structures With applications to Computer Science by R.Hamming and E.A.Feigenbaum
7. The Essence of Discrete Mathematics by Neville Dean
8. Discrete Mathematics and its Applications with Combinatorics and Graph theory, by – Kenneth H. Rosen, McGraw Hill -2007 7th Edition.

CC MAT-604 B: Operations Research

Unit-01 Network Models- Concept of Networks:

Transportation Problem- Introduction, general method of a T.P., unbounded T.P. NWCM, Least cost method, VAM methods to find the initial solution, Dual of a T.P. and MODI method, degeneracy in a T.P., variatons in T.P.- Maximization T.P. and prohibited routes.

Assignment Problem- General model of A.P.(A.P. as a special case of a T.P.) Hungarian Method of solving a A.P., variations in a A.P.- maximization, prohibited assignments.

Unit-02 Sequencing Problem:
Methods of sequencing, Johnson's Algorithm for a two machine problem, three machine problem and M-machine problem, Processing Two jobs through M-machines

Unit-03 Game Theory:
Introduction, Two-person zero games, Minimax and Maximin principles, saddle point theorems, mixed strategies, method for solution of 2×2 game, dominance principles, solution of games without sadddle points by using dominance and then mixed strategies, graphical method of solving 2×m and m×2 game, L.P. solution of games.

- **REFERENCES BOOKS:**

1. Operations Research , by. J.K.Sharma. Macmillan Publishers India Ltd.
2. Operations Research by Nita Shah, Ravi Gor and Hardik Soni, Prentice Hall of India.
3. Operations Research(Principles and Practice) by Pradeep Prabhakar Pai, Oxford University Press.
4. Operations Research by Prof. N.P. agarwal, Ramesh Book Depot, Jaipur.

PC MATH-601 to 604

- **Objectives:**
  - Ensure the student can competently use the MATLAB programming environment.
  - Understand the capabilities of MATLAB for solving complex mathematical problems.
  - Understand the tools that are essential in solving real-world problems applying appropriate Mathematical concept.

PC-MAT-601 Input-Output Statements in MATLAB

Data input, interactive inputs, reading/storing file data, output commands, formatted input-output functions.

PCMAT-602 Programming Techniques

Loops, Branches control structures, MATLAB programming, function subprograms, types of functions, function handles, errors and warnings, MATLAB debugger.

PCMAT-603 MATLAB Applications:

The content of this unit is to be covered from the list
given in Appendix A.

PCMAT-604 Practical using MATLAB programming

List of practical is given in Appendix B.

- **Text Book:**
"MATLAB and its Applications in Engineering" Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, Pearson.

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- **Coverage from the Text Book:**
  PCMAT-601 Chapter 5: 5.6
  PCMAT-602 Chapter 7: 7.3, Chapter 8: 8.9
  PCMAT-603 Appendix A: Table A.1:A.8
  PCMAT-604 Appendix B

Appendix A:Table A.1

Discrete Math\Number theoretic functions	
factor	Returns Prime factors
factorial	Factorial function
nchoosek	All combinations of N elements taken K at a time
perms	All possible permutations
gcd	Returns the greatest common divisor.
lcm	Returns the least common multiple.
primes	Generate list of prime numbers
isprime	Returns a logical array that is prime numbers.
rat, rats	Returns a rational fraction approximation.
mod	The mod function is useful for congruence relationships. Returns modulus
rem	Returns remainder after division.

Table A.2

Coordinate System Conversion	
cart2sph	Transform Cartesian to spherical coordinates
cart2pol	Transform Cartesian to polar coordinates
pol2cart	Transform polar to Cartesian coordinates
sph2cart	Transform spherical to Cartesian coordinates

Table A.3

Interpolation Functions	
interp1	Linear and cubic-spline interpolations of a function of one variable.
interp2	Linear interpolation of a function of two variables.
spline	Cubic-spline interpolation.
unmkpp	Computes the coefficients of cubic-spine polynomials.

Table A.4

Numerical Integration Functions	
quad	Numerical integration with adaptive Simpson's rule.
quadl	Numerical integration with adaptive Lobatto quadrature.
trapz	Numerical integration with the trapezoidal rule.
quadv	Vectorized quadrature
dblquad	Numerically evaluate double integral
triplequad	Numerically evaluate triple integral

Table A.5

Numerical Differentiation Functions	
diff(x)	Computes the difference between adjacent elements in the vector x.
polyder	Differentiates a polynomial, a polynomial product, or a polynomial

Table A.6

ODE Solvers	
ode23	Nonstiff, low-order solver.
ode45	Nonstiff, medium-order solver.
ode113	Nonstiff, variable-order solver.
ode23s	Stiff, low-order.
ode23t	Moderately stiff, trapezoidal rule solver.
ode23b	Stiff, low-order solver.
ode15s	Stiff, variable-order solver.
odeset	Creates integrator options structure for ODE solvers.
deval	Evaluate solution of differential equation problem
bvp4c	Solve boundary value problems for ODEs

Table A.7

Optimization	
fminbnd	Finds minimum of single-variable function.
fzero	Finds zero of single-variable function.
fminsearch	Multidimensional unconstrained nonlinear minimization
lsqnonneg	Linear least squares with nonnegativity constraints
fminunc	Find minimum of unconstrained multivariable function
fmincon	Find minimum of constrained nonlinear multivariable function
linprog	Solve linear programming problems

Table A.8

Statistical Functions	
erf(x)	Computes the error function *erf*(x).
mean	Calculates the average.
median	Calculates the median.
std	Calculates the standard deviation.
var	Calculates the variance.
corrcoef	Correlation coefficients
cov	Covariance matrix

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Appendix B:

1. Numerical Methods Practical (Lab) using MATLAB programming
2. Linear Algebra
3. Graph Theory
4. Calculus
5. Optimization
6. Problems related to programming given in text book.

Assignment: The work should involve programming using MATLAB. The student should submit the electronic copy of .m files or/and diary file showing the execution/output of Matlab session(s).

N.B.: As the *CBCS has a high probability to be operationalised efficiently and effectively for the elevating learners*, the Essential Requirements for all Mathematical Practical including MATLAB Practicals of Mathematical subjects are as under:

1. **Mathematical Laboratory inbuilt with sufficient number of Computers (as per the students enrollments and the number of practical batches) and MATLAB SOFTWARE with basic requirements for the MATLAB Practicals.**
2. **Mathematical Laboratory inbuilt with Graphs, Charts, Printer, Physical Models (two dimensional as well as three dimensional) & Virtual Models (Higher Dimensional – Computerized) and basic requirements for the same.**
3. Use also "PYTHON" Software instead of MATLAB Software.
4. ***Essential Requirement for Mathematical Computer Laboratory:***

(i) Atleast One full time Computer Operator having mathematical ability to run Matlab Software and related Computerized Mathematical Practical.

(ii) One Peon for computer laboratory.

Subjective Elective
ES–MAT-61 Business Statistics

Unit-01 Measures of central tendency:
Mean, Median, Mode, Harmonic mean, Geometric mean, Arithmetic mean.
Measure of dispersion: Range, Quartile Range, Mean Deviation, Standard Deviation, Variance.

Unit-02 Correlation & Regression analysis:
Definition of correlation, positive & negative correlation,Scatter diagram, Carl-Pearson's coefficient of linear correlation, Properties of correlation coefficients and its examples, regression coefficient, properties of regression coefficient and its examples.

- **References :**

1. Business Statistics, by J.K.Sharma.
2. Business Statistics , by R.S.Bhadyaj
3. Business Statistics , by Bharat Jhnujhunwala
4. Advanced Practical Statistics, by S.P.Gupta , D.Chand & Co. Ltd, New Delhi.

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Modified Detailed Syllabus of CBCS PROGRAMME Pattern for B. Sc.(Mathematics) Semester System

PROGRAM CODE : HNGU1054

With Effect from June: 2021

FACULTY : SCIENCE

SUBJECT : MATHEMATICS

CLASS : Bachelor of Science.

SEMESTER : III to IV

TOTAL PAGES : 01 TO 11 (WITH COURSE STRUCTURE)

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Hemchandracharya North Gujarat University, Patan-384265.

B.Sc. (Mathematics): PROGRAMME Structure under CBCS

With Effect from June: 2021

Mission: Our mission is to provide opportunities for developing basic-quality mathematical skills and achievementfor their betterment of life through scientific and technological development.

Learning outcomes: Four major focusing areas: Logical Reasoning & Motivation; Analysis & Problem solving;Information & Technology Proficiency.

Vision: To Motivate Individuals to excel in the mathematical basic knowledge-driven environment of the 21stcentury through curriculum and train integrally human resources through teaching. We **Focus** on quality education.

(1) EDUCATIONAL AIMS:

Mathematics is one of the fundamental disciplines in science. It is the basic for all the disciplines. To makeeducation more effective and learner centric, restructurisation of curriculum becomes essential. As a positive step in this direction and in order to respond to the emerging trends in the global scenario, it is decided to introduce the Choice Based Credit System (CBCS) from the academic year 2011-12 and modified it after three years. Under this system, the academic programme becomes student-oriented, relevant, interdisciplinary and flexible.

(2) CONDITIONS FOR ADMISSION :

A candidate who has passed the H Sec-Science Degree examination of the state or any other examinations accepted by the Syndicate as equivalent thereto shall be eligible for admission to this B ScProgramme in Mathematics on full-time basis of study.

INTAKE rules for admission are as per University notification from time to time.

Students are allowed to take admissions to successive semesters under carry over benefit facility as per the norm decided by the university.

(3) *LEARNING OUTCOMES :*

The programme leading to this degree provides the opportunities to developand demonstrate knowledge and understanding in the following areas:

- **Knowledge and understanding:** When one has completed this degree he/she will haveknowledge and understanding of the fundamental concepts, principles and techniques from a range of topic areas.

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- **Cognitive skills:** When one has completed this degree he/she will be able to understand how to solvesome problems using the methods taught and develop abstract mathematical thinking.

- **Practical skills:** When one has completed this degree, he/she will be able to demonstrate theCommunicate clearly knowledge, ideas and conclusions about mathematics and improve his/her own learning and performance.

(4) DURATION OF THE COURSE:

The CBCS pattern B. Sc. programme with multidisciplinary approach in Mathematics is offered on a full-time basis. The duration of the course is of three academic years consisting of six semesters each of 15 weeks duration.

(5) TEACHING, LEARNING METHODS:

All relevant material is provided and taught in the course texts and through the study of set books. One will build up knowledge gradually, with sufficient in-text examples to support one's understanding. He/She will be able to assess his/her own progress and understanding by using the in-text problems and exercises at the end of each unit in form of practical using computer in computer laboratory.

(6) COURSE OF STUDY :

The curriculum has five major components:

1. *Principle/Core Courses (CC MAT)*
2. *Practical courses (PC MAT)*
3. *Elective Opt. Disciplinary courses (ES MAT)*
4. *Elective Generic course*
5. *Foundation Course*

There are at least 144 Credit COURSEs prescribed in the above classification as per the university norms to be studied to acquire B.Sc. Degree in Mathematics.

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⇛ COURSE STRUCTURE ☒

Course	Courses	Credit /course	Teaching Hrs Total	Total Credits	Examination Internal	Hours	External	Total Marks
SEMESTER-I								
Principle/Core Courses: CC-MAT-111	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-111	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –11 Set Theory & Functions	1	2	2	2	15	2	35	50
Elective Generic	1	2	2	2	15	2	35	50
Foundation Course	1	2	2	2	15	2	35	50
SEMESTER-II								
Principle/Core Courses: CC-MAT-122	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-122	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ESMAT –21 Industrial Mathematics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	50	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-III								
Principle/Core Courses: CC-MAT-301	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-302	1	3	3	3	30	2.5	70	100
Practical /PC- MAT-301	1	1.5	3	1.5	-	5	50	50
Practical /PC -MAT-302	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –31 Numerical Solution of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-IV								
Principle/Core Courses: CC-MAT-401	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-402	1	3	3	3	30	2.5	70	100
Practical/ PC- MAT-401	1	1.5	3	1.5	-	5	50	50

Practical/ PC MATH-402	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –41 Improper Intrgrals	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-V								
Principle/Core Courses: CC-MAT-501	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-502	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-503	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-504	1	3	3	3	30	2.5	70	100
Practical/PC MAT-501	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-502	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-503	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-504	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ESMAT –51 Theory of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-VI								
Principle/Core Courses: CC-MAT-601	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-602	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-603	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-604	1	3	3	3	30	2.5	70	100
Practical/PC MAT-601	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-602	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-603	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-604	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –61 Business Statistics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50

N.B.: *Work-loaddepends on the number of students and the number of Batches/Groups ,forPractical and Cognitive-skill based Course.*

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As the *CBCS has a high probability to be operationalized efficiently and effectively for the elevating learners*, the Essential Requirements for all Mathematical Practical including MATLAB / PYTYHON / SCILAB practicals of Mathematical subjects are as under:

1. Mathematical Laboratory inbuilt with sufficient number of Computers (as per the students enrollments and the number of practical batches) and MATLAB / PYTYHON / SCILAB SOFTWARE with basic requirements for the Practicals.
2. Mathematical Laboratory inbuilt with Graphs, Charts, Printer, Physical Models (two dimensional as well as three dimensional) & Virtual Models (Higher Dimensional – Computerized) and basic requirements for the same.
3. *Essential Requirement for Mathematical Computer Laboratory:*

   At least One full time Computer Operator and one Peon for computer laboratory having mathematical ability to run MATLAB / PYTYHON / SCILAB Software and related Computerized Mathematical practicals.

B.Sc. (Mathematics) Semester-3

CC-MAT-301: Differential Calculus

Unit-01 Limit, continuity and partial Derivatives:

Functions of several variables, their limits and continuity, partial derivatives, differentiability and differential, chain rule, differential and derivatives of higher orders, condition for commutativity of independent variables in higher derivatives, derivatives of implicit functions.

Unit-02 Applications of partial derivatives:

Euler's theorem for homogeneous functions, Extrema of functions several variables, application of Lagrange's method of undetermined multiplies, Taylor's and Maclaurin's expansion for functions of two variables, Tangent and normal plane to twist curve, Tangent plane and normal to surface.

Unit-03 Differential Geometry:

Curvature in Cartesian co-ordinates, Curvature in Polar co-ordinates, radius of curvature of plane curve, Centre of curvature and circle of curvature of curve, evolute and involute, Singular point for plane curve, double point, all types of points(point of inflexion for plane algebraic curve)

- **Textbook:**

  The main book for the course (Unit I and II) is '**Differential Calculus'** by Shantinarayan, S. Chand , New Delhi.

- **Reference Book:**
  1. Advanced Calculus, D V Widder, Prentice Hall , New Delhi.
  2. Advanced Calculus Vol : I & II, T M Apostol, Blaisdoll
  3. Advanced Calculus, R C Buck, MacMillan
  4. Kalan Shashtra Part I , D H Pandya and N D Suthar, University GranthNirman Board (Gujarati)
  5. Kalan Shashtra Part II, A M Vaudya and V H Pandya, University GranthNirman Board (Gujarati)

CC-MAT-302: Numerical Analysis

Unit-01 **Finite Differences table and theory of interpolation:**
Ascending and descending differences, Symbolic operators, Difference of polynomial, factorial polynomials, Gregory-Newton's forward and backward interpolation formula.

Unit-02 **Divided Differences:**
Newton's divide difference interpolation formula, Lagrange's interpolation formula for equal and unequal intervals
Central Difference interpolation formula:
Guass' forward and backward formula, Sterling interpolation formula, Bessel's interpolation formula.

Unit-03 **Numerical differentiation and integral:**
General Quadrature formula for equidistance ordinates, Trapezoidal rule, Simpson's 1/3th rule, Simpson's $3/8^{th}$ rule, Picard's method, Taylor's method, Euler's method.

- **Reference books:**
  1. Numerical Analysis,Kunz, McGraw Hill.
  2. Numerical Analysis, R. Gupta, Anmol Pub.Pvt.Ltd, New Delhi.
  3. Numerical Analysis,P.N.ChatterjiRajson'sPrakashanmandir, Meerut.
  4. Methods in Numerical Analysis K.W.NelsonMac-Millan
  5. Numerical Methods,Dr.V.N.Vedomurthy, Vikas Publishing House Pvt. Ltd.
  6. Numerical Methods in Engineering and Science,Dr.B.S.Grewal,Khanna Pub.
  7. Numerical Analysis and Computational Procedures, S.A.Mollah, New Central Book Agency, Calcutta.

PC –MAT-301: Practicals on Differential Calculus

1. Application of Limit and Continuity (Two Practicals)
2. Application of Partial Derivatives (Two Practicals)
3. Application of derivatives of implicit functions.
4. Application of Lagrange's' method of undermined multiplies
5. Application of Euler's theorem
6. Application of Tailor's and Maclaurin theorems.
7. Application of radius of curvature. (Three practicals for Cartesian,polar and parametric curves)
8. Application to find center of curvature and circle of curvature.(Two Practicals)
9. To determine the types of double points.(Two practicals)

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PC –MAT-302: Practicals on Numerical Analysis

1. Application of Gregory-Newton forward formula.
2. Application of Gregory-Newton backward formula.
3. Application of Factorial polynomials.
4. Applications of Newton's divided difference formula.
5. Application of Lagrange's interpolation formula for unequal intervals.
6. Application of Gauss forward interpolation formula.
7. Application of Gauss backward interpolation formula.
8. Application of Sterling interpolation formula
9. Application of Bessel's interpolation formula.
10. Application on Numerical differentiation.
11. Application of Taylor's method.
12. Application of Picard's method.
13. Application on Euler's method.
14. Application of Trapezoidal rule.
15. Application of Simpson's 1/3 rule.
16. Application of Simpson 3/8 rule.

[Practicals should be conducted with the help of either scientific Calculator or appropriate software like Python, MATLAB, SciLab]

Subject Elective Course

ES-MAT-31: Numerical Solutions of Equations

Unit-01: Applications of Graphical Method, Applications of Bisection Method, Applications of Method of False position, Applications of Method of Iteration

Unit-02: Applications of Newton Raphson's method, Applications of Birge-Vieta method, Applications of Horner's Method

- **Reference books**:

1. Numerical Analysis (Golden Series) By N. P. Bali
2. Numerical Methods, Dr.V.N. Vedomurthy, Vikas Publishing House Pvt. Ltd.
3. Numerical Methods in Engineering and Science, Dr.B.S.Grewal, Khan

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હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in Website : www.ngu.ac.in

પરિપત્ર ક્રમાંક – ૧૬૮ / ૨૦૨૧

વિષયઃ વિજ્ઞાન વિદ્યાશાખાના સ્નાતક કક્ષાના નવા અભ્યાસક્રમો અંગે...

આ યુનિવર્સિટી સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાએ કરેલ ભલામણ અનુસાર નીચેના વિષયોના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો **જૂન – ૨૦૨૧ થી ક્રમશઃ અમલ માં આવે તે રીતે** એકેડેમિક કાઉન્સિલએ તેની તા. ૦૯/૦૬/૨૦૨૧ ની સભા ના નિર્દિષ્ટ ઠરાવો થી મંજૂર કરેલ છે. જેનો અમલ કરવા સારૂ સંબંધિતોને આ સાથે મોકલવામાં આવે છે, જેનો ચુસ્ત અમલ થવા વિનંતી છે.

ક્રમનં.	અભ્યાસક્રમ	એકેડેમિક સભાના ઠરાવક્રમાંક	સેમેસ્ટર	પાના નંબર
૧	બાયોટેકનોલોજી	૨૬	સેમ.–૩ થી ૬	૧ થી ૩૯
૨	વનસ્પતિશાસ્ત્ર	૨૭	સેમ.–૩ અને ૪	૧ થી ૩૪
૩	ભૌતિકશાસ્ત્ર	૨૯	સેમ.–૩ અને ૪	૧થી ૨૩
૪	રસાયણશાસ્ત્ર	૩૦	સેમ.–૩ અને ૪	૧ થી ૧૯

આ બાબતની સંબંધિત અધ્યાપકો તથા વિદ્યાર્થીઓને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

નોંધઃ (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજ ના ગ્રંથાલયમાં મૂકવાની રહેશે.
(૨) આ અભ્યાસક્રમ યુનિવર્સિટીની વેબ સાઈટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

સહી/–
અધ્યક્ષ

બિડાણઃ ઉપર મુજબ

કુલસચિવવતી

નં.–એ કે / અ× સ / ૧૪૭૫ / ૨૦૨૧
તારીખ : ૨૧ / ૦૬ / ૨૦૨૧

પ્રતિ,

૧. અધ્યક્ષશ્રી/ કો.ઓર્ડીનેટરશ્રી –વિજ્ઞાન વિદ્યાશાખા અંતર્ગત અનુસ્નાતક વિભાગો, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૨. સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓ
૩. ડૉ. જગદીશ એચ. પ્રજાપતિ (ડીનશ્રી – વિજ્ઞાન વિદ્યાશાખા),સરકારી સાયન્સ કોલેજ, **થરાદ.** જિ. બનાસકાંઠા
૪. વિજ્ઞાન વિદ્યાશાખા હેઠળના વિષયોની અભ્યાસ સમિતિઓના ચેરમેનશ્રીઓ.
૫. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (પાંચ નકલ)
૬. ઈનચાર્જ ઓફિસરશ્રી, સબસેન્ટર, ખેડબ્રહ્મા કેમ્પસ, મુ. વડાલી , જિ. સાબરકાંઠા. (હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, **પાટણ.)**
૭. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)
૮. સીસ્ટમ એનાલીસ્ટ, કોમ્પ્યુટર(રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ. યુનિવર્સિટી,પાટણ તરફ વેબસાઈટ પર મૂકવા સારૂ.
૯. પ્રવેશ પ્રશાખા(એકેડેમિક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.
૧૦. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમ. ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ– પરિપત્રની ફાઈલ અર્થે
૧૧. સિલેકટ ફાઈલે– (૨ નકલ)

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B.SC. BIOTECHNOLOGY SEM 3 SYLLABUS

w.e.f June 2021

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B.Sc Semester III

Biotechnology

Principles of metabolism I

Semester III

BT-301

Learning Outcomes:

1. Differentiate between kinetic and potential energy.
2. Understand the First and Second Laws of Thermodynamics and describe how they reflect the existence and behavior of energy in the universe.
3. Define enthalpy, entropy, and free energy, and describe how these concepts affect the fate of chemical reactions.
4. Explain the energy requirements of endergonic and exergonic reactions.
5. Describe how oxidation and reduction are interrelated in chemical reactions.
6. Understand the structure of ATP and describe how ATP makes a wide variety of thermodynamically unfavorable cellular processes possible.
7. Describe the importance of activation energy and how it can be altered.
8. Explain the various ways in which enzymes increase the rate of biological reactions.
9. Explain how cofactors, prosthetic groups and other aspects of the chemical environment affect enzyme activity.
10. Define competitive inhibition, noncompetitive inhibition, and activation and explain how each relates to the active and allosteric sites.
11. Understand the unique catalytic nature of and properties associated with ribozymes.
12. Explain the relationship between anabolic and catabolic pathways in metabolism and describe the storage and release of energy in the forms of ATP and NADH.
13. Describe the three major ways cells regulate metabolic pathways.
14. Describe the mechanisms used by cells to recycle components of macromolecules and organelles for use in the synthesis of new molecules and structures.
15. Explain how recycling of cellular components reduces the overall energy requirements of the cell.

Unit I Biological thermodynamics

1.1 Laws of thermodynamics
1.2 Definition of Internal energy, Enthalpy, Entropy, Gibbs's free energy and relationship among tham.
1.3 Relationship between free energy change, standard free energy change and equilibrium constant.
1.4 Additive nature of free energy change and its biological significance.
1.5 ATP and other energy rich compounds.

Unit II Protein and enzymes

2.1 Tertiary and quaternary structure of proteins.

2.2 Definition of catalyst, difference between biocatalyst and inorganic catalyst.

2.3 Definition of appoenzyme, cofactor, coenzyme, prosthetic group, holloenyme.

2.4 Mechanism of action of enzyme, MM kinetics, double reciprocal plot .

2.5 Factors affecting enzyme-catalyzed reactions.

Unit III Regulation of enzyme activity

3.1 Regulation of enzyme by allosteric mechanism.

3.2 Role of covalent modification in enzyme regulation

3.3 Enzyme inhibition, types of enzyme inhibition.

3.4 Use of inhibitors as anti microbial drugs.

Unit IV Signal transduction

4.1introduction to signal transduction pathways.

4.2 types of signaling receptors.

4.3 Signaling pathways: Extracellular

4.4 Signaling pathways: intracellular.

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B.Sc Semester III

Biotechnology

Classical genetics and instrumentation

Semester III

BT-302

Learning Outcomes

1. Explain how Mendel's particulate mechanism differed from the blending theory of inheritance.
2. Define the following terms: true breeding, hybridization, monohybrid cross, P generation, F1 generation, F2 generation.
3. Use a Punnett square to predict the results of a monohybrid cross, stating the phenotypic and genotypic ratios of the F2 generation.
4. Describe Mendel's Law of Segregation and the phase of meiosis in which it is applied.
5. Distinguish between the following pairs of terms: dominant and recessive; heterozygous and homozygous; genotype and phenotype.
6. Explain how a testcross can be used to determine if an individual with the dominant phenotype is homozygous or heterozygous.
7. Use a Punnett square or probabilities to predict the results of a dihybrid cross and state the phenotypic and genotypic ratios of the F2 generation.
8. State Mendel's law of independent assortment and describe how this law can be explained by the behavior of chromosomes during meiosis

9. Explain the theoretical aspects of key analytical techniques and instruments used in geochemistry, including but not limited to electron microscopy, X -ray diffraction, mass spectrometry and spectroscopy (including synchrotron techniques).
10. Strategically plan analytical campaigns to apply to different types of samples and research objectives, including selection of the most appropriate technique/instrumentation for the students' research project.
11. Undertake the correct sample preparation and characterization prior to analysis by the chosen techniques or instruments.
12. Design an analytical work-flow to acquire data and achieve the research objectives of their project.
13. Process data from the chosen instruments and demonstrate understand ing of the limitations and quality of the data. Justify the approach taken to data processing.
14. Write a clear and concise justification and description of the analytical techniques employed, suitable for publication in a scientific journal.

Unit 1

1.1 Mendel's experiments with garden pea and Mendel's law of inheritance.
1.2 Incomplete and co dominance.
1.3 Linkage and its types
1.4 Genetic interaction: allelic and non allelic.

Unit 2 Mutaton

2.1 Defination and types of mutation and molecular basis of mutation.

2.2 Physical and chemical mutagens

2.3 Use of mutation: Reversion and suppression.

2.4 In born error of metabolism in human.

Unit 3 Chromatography and electrophoresis

3.1 Chromatography: Paper chromatography, TLC, Gel filteration chromatography, Ion exchange chromatography.

3.2 Electrophoresis: Poly acrylamide Gel electrophoresis(PAGE), SDS -PAGE, agarose gel electrophoresis.

Unit 4 Spectroscopy

4.1 Overview of electromagnetic spectrum

4.2 Principle and applications of UV -Visible spectroscopy.

4.3 IR spectroscopy.

4.4 x ray diffraction spectroscopy.

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B.Sc Semester III

Biotechnology : Subjective elective

Human endocrinology

Semester III

BT-ES-1

Learning Outcomes

1. The student will demonstrate an understanding of the anatomy of the endocrine system.
2. The student will demonstrate an understanding of the basic properties of hormones.
3. The student will demonstrate the role of hormones in maintaining body function.
4. The students will demonstrate those endocrine details helpful in the clinical realm.
5. The student will demonstrate knowledge of the major endocrine disorders.

Unit 1

1.1 Defination of hormone, organized and non organized endocrine organ or tissue of human
1.2 Hypothalamus and pituitary hormones.
1.3 Thyroid and parathyroid hormones
1.4 Role of thymus as endocrine gland

Unit 2

2.1 Pancreas as endocrine gland.

2.2 Adrenal gland hormones.

2.3 Different non organized endocrine tissues of human body

2.4 Mechanism of hormone action

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B.Sc Semester III

Biotechnology : Subjective elective

Enzymology

Semester III

BT-ES-2

Learning Outcomes

1. Describe and use the equations of enzyme kinetics.
2. Describe the methods used in enzyme kinetics.
3. Describe the principles of enzyme inhibition.
4. Describe the mechanisms of enzyme catalysis.
5. Describe the catalytic mechanisms employed by the well-characterized enzymes.
6. Describe the mechanisms of enzyme regulation

Unit 1

1.1 Production of industrially important enzymes
1.2 Applications of enzymes in industries – Amylase, Lipase, Protease
1.3 Applications of enzymes in medical industry – as therapeutics, enzyme therapy

Unit 2

2.1 Production of genetically engineered enzyme

2.2 Applications of enzyme in biosensor devices – eg. glucometer, pollutant monitoring

2.3 Applications of enzymes in dairy and agriculture industry

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B.Sc Semester III

Biotechnology

Semester III

Practicals

1. Quantification of protein using by Biuret test.
2. Quantification of protein using by Folin -Lowry assay.
3. Effect of Substrate concentration (Determination of Km and Vmax).
4. Determine temperature optima of the enzyme.
5. Effect of pH on enzyme activity.
6. Effect of enzyme concentration.
7. Paper Chromatography of Amino acids.
8. TLC Chromatography of Amino acids.
9. Agarose electrophoresis of DNA
10. Determine maximum absorption spectra of substance.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN - 384 265

FACULTY OF SCIENCE

B.Sc. BOTANY

Semesters: III

SYLLABUS

Curriculum as per UGC Guideline

With Semester/CBCS/Grading Pattern

With effect from June - 2021 (and thereafter)

DATE: June, 2021 **TOTAL PAGE: 19**

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN - 384 265.

U.G. (B.Sc.) Programme

CBCS:: Semester :: Grading Pattern

With effect from: June - 2021

FACULTY OF SCIENCE

Subject: BOTANY

B. Sc. Semesters: III

Total Pages: 01 to 19

Submitted on
Date: 07/04/2021

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SUMMARY OF THE PROGRAMME

Summary of the Programme

✓ Syllabus duration	Semester pattern i.e., **Six** months
✓ *No. of core compulsory (CC) course*	***02*** *(in each semester)*
✓ *Credits per CC course*	*03*
✓ *Total credits for CC course*	***06****/Semester*
✓ *Theory lectures per CC course*	*03 /week*
✓ *Total Theory lectures for CC course*	*06 /week*
✓ No. of Practical courses per semester	**02**
✓ Practical lectures	03 /week/course/batch
✓ Total Practical lectures	06 /week/ batch
✓ Credits per Practical course	**1.5**
✓ Total Credits of Practical course	**03** /Semester
✓ No. of Practical course (in Uni. Exam.)	**02** /Semester
✓ No. of Elective Subjective (ES) course	**01** (in each semester)
✓ Credits for ES course	**02** (in each semester)
✓ Theory lectures per ES course	02/week
✓ No. of Elective Generic (EG) course	**01**
✓ Credits for EG course	**02**
✓ Theory lectures per EG course	02/week
✓ Examination (including Preparation)(weeks)	05
✓ No. of Days per week	06
✓ Weeks (days) available for Teaching	**15** (90)
✓ Duration of each lecture (minutes)	55
✓ No. of students/batch	**20** (on approval of AC and Exam. unit)

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Under Choice **B**ased **C**redit **S**ystem-Semester-Grading System pattern

U G (B. Sc.) Programme in Botany

Semester - III

Salient Features:

- CBCS in UG programme in **Botany Semester III** shall be offered from the Academic year **June 2021**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2021-22.
- A student will have to get enrolled a **Core course** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting an **Elective** as well as **Foundation** courses from a pool of courses.
- Each course shall be assigned a specific number of **Credits**.
- A Core course is the course which should compulsorily be studied by a candidate as a Core requirement so as to get degree in a said discipline of study.
- There shall be **Two Core Compulsory** courses (Theory) each with **3 credits** in each semester and their practical's each with **1.5 credits**. Thus, a credit weight-age in **B.Sc.** programme for each semester core course shall be of **6 credits**. In short, **9** credits multiplied by **2** subjects equal to total of **18 credits**.
- In addition to the Core courses, a student will have to choose Elective as well as Foundation courses from a pool of courses.
- **Two** courses of **Elective**, one each from **Generic Elective** and Interdisciplinary / Multidisciplinary / **Subject centric electives** shall have to be offered. The credit weight-age for each Elective course shall be of **02 Credits**. Hence, a total credit weight-age for Elective courses shall be of **4 credits**.
- One **Foundation** (English Language L.L.) course shall have to be offered. The credit weight-age for Foundation course shall be of **02 credits**.
- Each course shall have a unique Course code. The Core courses, Elective courses and the Foundation courses shall be abbreviated respectively as **CC, PC, EG, ES and FC.**

1. Core Compulsory **CC**

   Practical Core (Core Elective) **PC**
2. Elective Generic **EG**

   Elective Subject **ES**
3. Foundation Compulsory **FC**

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- Each Academic year shall consist of **two** semesters, each of **15weeks** of teaching equivalent to 90 working days. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.
- The course with **4 credits** shall be of **60 hrs** (15 weeks x 4 credits) duration. The course with **3 credits shall** be of **45 hrs** (15 weeks x 3 credits) duration. The course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.
- **A general framework for Bachelor of Science (B.Sc.) programme shall be as follows:**

Semester wise credits						**Total credits of the Programme**
I	**II**	**III**	**IV**	**V**	**VI**	
24	24	24	24	24	24	**144**

- **The semester wise weight age of core, elective and foundation courses shall be as follows:**

Academic year	**Core compulsory Courses**	**Elective courses**	**Foundation courses**
Semester I & II	65-75%	15-20%	10-15%
Semester III & IV	65-75%	15-20%	10-15%
Semester V & VI	65-75%	15-20%	10-15%

- **Attendance:**

  The Attendance Rules as per the norms of Hemchandracharya North Gujarat University.

- **Medium of Instruction:**
- The Medium of Instruction shall be of **Gujarati** and/or **English medium**.
- Student is free to write answers either in **Gujarati** and/or **English** language.
- **Language of Question paper:**

  Question paper should be drawn in **Gujarati** language and its **English** version should be given.

- **Evaluation Methods:**

  Academic performance in various courses *i.e.* core, discipline electives, generic electives and skill enhancement courses are to be considered as parameters for assessing the achievement of students in botany. A number of appropriate assessment methods of

botany will be used to determine the extent to which students demonstrate desired learning outcomes. Following assessment methodology should be adopted;

1. The oral and written examinations (Scheduled and surprise tests).
2. Closed-book and open-book tests.
3. Problem-solving exercises.
4. Practical assignments and laboratory reports.
5. Observation of practical skills.
6. Individual and group project reports.
7. Efficient delivery using seminar presentations.
8. Viva voce interviews are majorly adopted assessment methods for this curriculum.
9. The computerized adaptive testing, literature surveys and evaluations, peers and self-assessment, outputs form individual and collaborative work are also other important approaches for assessment purposes.
10. A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**)/ (**Internal Evaluation**) as well as the **End of Semester examination** (**External Evaluation**). The weight-age of CCA shall be 30%, whereas the weight-age of the Semester end examination shall be 70%. There will be **no internal evaluation in practical courses.**
11. In Semester assessment (**CCA**)/ (**Internal Evaluation**) is spread through the duration of the course and is to be done by the Teacher teaching the course. BoS of the subjects will decide various criteria and their weight-age for CCA. The assessment is to be done by various means including:
    - ✓ Written Tests
    - ✓ MCQs based Tests/Quiz
    - ✓ Presentations/Seminars
    - ✓ Project work/Field work
    - ✓ Group discussions/Group activities
    - ✓ Assignments, etc.
12. The distribution of **Internal Evaluation** is given as per criteria given below for **30** marks:

Written Test…	**20** marks,
Assignments/MCQs/Very Short questions…	**05** marks and Attendance and
Regularity, Punctuality…	**05** marks.

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13. The **End of Semester examination** (**External Evaluation**) shall have an assessment based upon following perspective with respect to all the courses:
    a. Evaluation with respect to Knowledge
    b. Evaluation with respect to Understanding
    c. Evaluation with respect to Skill
    d. Evaluation with respect to Application
    e. Higher Order Thinking Skills
14. With respect to all the above components, there shall be following types of Questions from each unit of the course.
    a. MCQs/Fill in the blanks/ Match the pairs, etc
    b. Short answer questions
    c. Medium answer questions
    d. Long answer questions
    e. Examples/ Problems, etc.
15. The End of Semester Examination will be conducted by the University. A certified journal of the respective practical course **must be produced** at the time of practical examination by the student.
16. It will be compulsory for a candidate to obtain passing percentage in both Internal as well as External Evaluation. The passing marks for each course shall be **40%** as decided by concern Board of Studies in Botany.
17. Promotion, Re-Admission and Time for Completion of Course, Procedure for Awarding Grades, Provision for Appeal, etc. as decided by the Hemchandracharya North Gujarat University.

STUDY TOUR:

Botanical excursion/study tour may be arranged (by the concern faculty with prior permission of **HoD and/or Principal**) within state and/or outside the state to explore/study plant diversity in its natural habitats.

SUBMISSION:

Instead of submission of Herbarium sheets and/or specimens at the time of final (Uni.) practical examination student may submit photographs/ drawings/ charts/ models or CD having such photographs/drawings of plant species to conserve plant species in their natural habitats and to avoid any damage to plant species and its natural habitat.

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ELECTIVE (SUBJECTIVE) COURSE:

For semester-III list of course is given below.

1. **Elective (Subject) Course :: ES BOT-301:: Plant Diversity and Human Welfare**

SELECTION OF ELECTIVE (GENERIC) COURSE:

- For semester-III and IV a separate consists of courses is offered by university. Students may select **any one** of them from offered courses in Semester-III and Semester-IV separately.

AIMS:

1. To transform curriculum into outcome-oriented scenario.
2. To develop the curriculum for fostering discovery-learning.
3. To equip the students in solving the practical problems pertinent to India.
4. To adopt recent pedagogical trends in education including e-learning, flipped class, hybrid learning and MOOCs.
5. To mold responsible citizen for nation-building and transforming the country towards the future.
6. To provide an environment that ensures cognitive development of students in a holistic manner. A dialogue about plants and its significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects.
7. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
8. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
9. To enable the graduate prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination.

SEM-III: CC-BOT-301: MYCOLOGY AND PHYTOPATHOLOGY

LEARNING OUTCOME:

On completion of this course, the students will be able to:

- Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.
- Demonstrate skills in laboratory, field and glasshouse work related to mycology and plant pathology.
- Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies.
- Identify the common plant diseases according to geographical locations and device control measures.

SEM-III: CC-BOT-302: ARCHEGONIATE

LEARNING OUTCOME:

On completion of this course, the students will be able to:

- Demonstrate an understanding of archegoniatae, Bryophytes, Pteridophytes and Gymnosperms.
- Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
- Understanding of plant evolution and their transition to land habitat.
- Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Bryophytes, Pteridophytes, Gymnosperms.

ES-BOT-301: Plant Diversity and Human Welfare

LEARNING OUTCOME: On completion of the course, the students will be able to:

- Develop understanding of the concept and scope of plant biodiversity.
- Identify the causes and implications of loss of biodiversity.
- Apply skills to manage plant biodiversity.
- Utilize various strategies for the conservation of biodiversity.
- Conceptualize the role of plants in human welfare with special reference to India.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc. Programme with 144 credits CBCS-Semester-Grading Pattern

w.e.f. June-2021

General Pattern/Scheme of study components along with credits for Science faculty.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN						
B.Sc. three year (General) Programme with 144 credits Semester-III and IV in BOTANY w.e.f. June-2021						
General Pattern/Scheme of study components along with credits						
Study Components		**Ins. Hrs/ Week**	**Examination**			**Credit**
			Internal Marks	**Uni. Exam.** Marks	**Total** Marks	
Semester-III						
	Core Compulsory (CC) Course					
CC-I-3	Core Course-I (Paper-3)	3	30	70	100	**3**
CC-I-4	Core Course-I (Paper-4)	3	30	70	100	**3**
CC-II-3	Core Course-II (Paper-3)	3	30	70	100	**3**
CC-II-4	Core Course-II (Paper-4)	3	30	70	100	**3**
	Soft-skill: Practical Core (PC) Course					
PC-I-3	Practical Core Course-I (Paper-3)	3		50	50	**1.5**
PC-I-4	Practical Core Course-I (Paper-4)	3		50	50	**1.5**
PC-II-3	Practical Core Course-II (Paper-3)	3		50	50	**1.5**
PC-II-4	Practical Core Course-II (Paper-4)	3		50	50	**1.5**
	Foundation Course (FC)					
FG-21	Compulsory English (L.L.)	2	15	35	50	**2**
	Elective Course (EC)					
EG-21	Elective (Generic) Course	2	15	35	50	**2**
ES-21	Elective (Subject) Course	2	15	35	50	**2**
		30	**165**	**585**	**750**	**24**
Semester-IV						
	Core Compulsory (CC) Course					
CC-I-5	Core Course-I (Paper-5)	3	30	70	100	**3**
CC-I-6	Core Course-I (Paper-6)	3	30	70	100	**3**
CC-II-5	Core Course-II (Paper-5)	3	30	70	100	**3**
CC-II-6	Core Course-II (Paper-6)	3	30	70	100	**3**
	Soft-skill: Practical Core (PC) Course					
PC-I-3	Practical Core Course-I (Paper-5)	3		50	50	**1.5**
PC-I-4	Practical Core Course-I (Paper-6)	3		50	50	**1.5**
PC-II-3	Practical Core Course-II (Paper-5)	3		50	50	**1.5**
PC-II-4	Practical Core Course-II (Paper-6)	3		50	50	**1.5**
	Foundation Course (FC)					
FG-21	Compulsory English (L.L.)	2	15	35	50	**2**
	Elective Course (EC)					
EG-21	Elective (Generic) Course	2	15	35	50	**2**
ES-21	Elective (Subject) Course	2	15	35	50	**2**
		30	**165**	**585**	**750**	**24**

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B.Sc Programme (CBCS - Semester - Grading Pattern)

B. Sc.:: BOTANY :: SEMESTER END EXAMINATION

Format for Questions paper Core Compulsory Course in Botany

(B.Sc. Sem. – III)

(W.E.F. JUNE - 2021)

The university examination paper consists of four questions.

- First question is of 20 marks and will be from Unit – I.
- Second question is of 20 marks and will be from Unit – II.
- Third question is of 20 marks and will be from Unit – III.
- Fourth question is of 10 marks and will be from Unit – I TO IV.

Time: 2.5 Hrs **Total Marks: 70**

1. Long answered and medium answered/short note-typed questions from Unit-I 18
   a. Long answered questions (Attempt any **two** from **three** each of **5** marks)
   b. Medium answered or short note-typed questions (Attempt any **two** from **three** each of **4** marks)

2. Long answered and medium answered/short note-typed questions from Unit-II 17
   a. Long answered questions (Attempt any **two** from **three** each of **5**marks)
   b. Medium answered or short note-typed questions (Attempt any **two** from **three** , 4+3 marks)

3. Long answered and medium answered/short note-typed questions from Unit-III 18
   a. Long answered questions (Attempt any **two** from **three** each of **5** marks)
   b. Medium answered or short note-typed questions (Attempt any **two** from **three** , 4+3 marks)

4. a. Answer the following questions (any six out of eight) 12
   (Objective type short questions)
   b. Answer the following questions (any 5 out of seven) 05
   (MCQs)

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B.Sc. Programme (CBCS - Semester - Grading Pattern)

B. Sc.:: BOTANY :: SEMESTER END EXAMINATION

Format for Questions paper Elective Course in Botany

(B.Sc. Sem – III)

(W.E.F. JUNE - 2021)

The university examination paper consists of three questions.

- First question is of 12 marks and will be from Unit – I.
- Second question is of 12 marks and will be from Unit – II.
- Third question is of 11 marks and will be from Unit – I & II.

Time: 2 Hrs **Total Marks: 35**

Q.1 (a) Attempt any one out of two. **06 Marks**

(b) Attempt any two out of three. **06 Marks**

Q.2 (a) Attempt any one out of two. **06 Marks**

(b) Attempt any two out of three. **06 Marks**

Q.3 (a) Attempt any three out of five (SQ). **06 Marks**

(b) Attempt any five out of eight. **05 Marks**

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B. Sc. Semester-III

Botany :: CC-BOT-301

Mycology and Phytopathology

(Credits: Theory-3, Practical-1.5)

Theory Lectures: 54

Unit 1: Fungi-1 (18 lectures)

- General characteristics; Affinities with plants. Thallus organization; Cell wall composition; Nutrition; Classification (Ainsworth).
- **Phycomycetes**: Zygomycetidae: Characteristic features. Thallus organisation; Reproduction; Life cycle and classification with reference to ***Rhizopus*.**
- **Ascomycetes**: General characteristics (asexual and sexual fruiting bodies); Life cycle and classification with reference to ***Claviceps*.**
- **Basidiomycetes**: General characteristics; Life cycle and Classification with reference to ***Agaricus***.

Unit 2: Fungi-2 (18 lectures)

- **Allied Fungi**: General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.
- **Lichens**: Occurrence; General characteristics; Classification; Study of thallus (morphological and anatomical), Reproduction; Economic importance.
- **Mycorrhiza**: Ectomycorrhiza, Endomycorrhiza and their significance.
- **Applied Mycology**: Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Medicines (Pharmaceutical preparations); Agriculture (Bio fertilizers).

Unit 3: Phytopathology (18 lectures)

- Terms and concepts; General symptoms.
- Geographical distribution of diseases. Host-Pathogen relationships.
- Pathogen, Symptoms, Dissemination, Disease cycle and control measures of following plant diseases:
  - Bacterial diseases – **Citrus canker.**
  - Fungal diseases – **White rust of crucifers.**
    Black rust of wheat.

B. Sc. Semester-III

Botany :: PC-BOT-301

Mycology and Phytopathology

Practicals:

1. ***Rhizopus***: study of asexual stage from temporary mounts and sexual structures through permanent slides/photographs/charts.
2. ***Claviceps***: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs/charts.
3. ***Agaricus***: Specimens of button stage and full grown mushroom; sectioning of gills of *Agaricus*. Permanent slides/photographs/charts.
4. ***Lichens***: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structure (apothecium) through Permanent slides/photographs/charts/specimen.
5. **Mycorrhizae**: Ectomycorrhiza and Endomycorrhiza (Photographs).
6. **Phytopathology**: Study of Plant diseases: Citrus Canker, White rust of crucifers and Black rust of wheat.

Suggested Readings

1. Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.

B. Sc. Semester-III

Botany :: CC-BOT-302

Archegoniate

(Credits: Theory-3, Practical-1.5)

Theory Lectures: 54

Unit 1: Bryophytes (18 lectures)

- General characteristics of Bryophytes; Adaptations to land habit; Classification (Rothmaler); Alternation of generations.
- Classification (up to family), morphology, anatomy and reproduction of ***Marchantia***.
- Classification (up to family), morphology, anatomy and reproduction of ***Funaria***.
- Vegetative reproduction and economic importance of bryophytes.

Unit 2: Pteridophytes (18 lectures)

- General characteristics of Pteridophytes; Classification (Smith); Economic importance of Pteridophytes.
- Classification (up to family), morphology, anatomy and reproduction of ***Equisetum*** (Developmental details not to be included).
- Classification (up to family), morphology, anatomy and reproduction of ***Nephrolepis*** (Developmental details not to be included).
- Heterospory and seed habit.

Unit 3: Gymnosperms (18 lectures)

General characteristics, classification of Gymnosperms (Sporne, 1965).

- Affinities with Pteridophytes and Angiosperms.
- Morphology, anatomy (leaflets and coralloid root) and reproduction of ***Cycas*** (Developmental details not to be included).
- Economic importance of Gymnosperms.

B. Sc. Semester-III

Botany :: PC-BOT-302

Archegoniate

Practical

1. ***Marchantia***- Morphology of thallus, whole mount of rhizoids & scales, vertical section of thallus through Gemma cup, whole mount of Gemmae (temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).

2. ***Funaria***- Morphology, whole mount of leaf, antheridial and archegonial heads, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads; longitudinal section of capsule and protonema.

3. ***Equisetum***- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).

4. ***Nephrolepis***- Morphology, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), transverse section of rachis, whole mount of prothallus with sex organs and young sporophyte (permanent slide).

5. ***Cycas***- Morphology (coralloid roots, bulbil, leaf, microsporophyll, megasporophyll), vertical section of leaflet, whole mount of spores (temporary slides), vertical section of microsporophyll, longitudinal section of ovule (permanent slide).

Suggested Readings

Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.

Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.

Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot. Allahabad.

Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.

Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc.:: BOTANY :: SEMESTER-III
ES-BOT-301 :: Plant Diversity and Human Welfare

(Credits: Theory-2)
Theory Lectures: 30
(Effective from June-2021)

Unit 1: Plant Diversity **(15 lectures)**

- Plant diversity and its scope- Genetic diversity, Species diversity and Ecosystem diversity.
- Values and uses of Biodiversity: Ethical and aesthetic values, uses of plants (Food value), Uses of microbes.
- **Loss of Biodiversity:** Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity.
- Conservation of diversity, *In situ* and *ex situ* conservation, Sustainable development.

Unit 2: Human Welfare **(15 lectures)**

- Importance of forestry their utilization and commercial aspects
- Avenue trees of India
- Ornamental plants of India.
- Alcoholic beverages through ages. Fruits and nuts: Important fruit crops their commercial importance. Wood and its uses.

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CBCS - Semester - Grading Pattern

B. Sc. :: BOTANY Practical :: SEMESTER-III

PC-BOT-301

(Effective from June-2021)

Date: **Place:**

Time: 5 Hrs **Total Marks: 50**

Instructions: Strictly follow the instructions given by examiner(s).

1. Identify and classify with giving reasons up to family of given specimen **A**. **08**

2. Identify and describe with structural peculiarities observed in the given specimen **B**.
   Draw the labelled diagram. **08**

3. Expose the pathogen from the given plant material **C** and prepare temporary slide.
   Make a labelled diagram and show your preparation to the examiner. **08**

OR

3. Make a temporary slide of the reproductive organ from the given specimen **C**.
   Draw the labelled diagram of it and show your slide to the examiner. **08**

4. Identify and describe as per given instructions: **16**

   1) Specimen – **D**: Permanent slide/charts (Unit – I Fungi)
   2) Specimen – **E**: Permanent slide/charts (Unit – II Lichens/Mycorrhiza)
   3) Specimen – **F**: Permanent slide/charts (Plant pathology)
   4) Specimen – **G**: Permanent slide/charts (Unit – I, II and III)

5. a. *Viva-voce* **05**

   b. Journal **05**

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CBCS - Semester - Grading Pattern

B. Sc. :: BOTANY Practical :: SEMESTER-III

PC BOT-302

(Effective from June-2021)

Date: **Place:**

Time: 5 Hrs **Total Marks: 50**

Instructions: Strictly follow the instructions given by examiner(s).

1. Identify and classify giving reasons up to family of given specimen **A**. **08**

2. Identify and describe structural peculiarities observed in the given specimen **B**.
   Draw the labelled diagram. **08**

3. Make a temporary slide of the reproductive organ from the given specimen **C**.
   Draw the labelled diagram of it and show your slide to the examiner. **08**

4. Identify and describe as per given instructions: **16**

   1) Specimen – **D**: Permanent slide/charts (Bryophyta)

   2) Specimen – **E**: Permanent slide/charts (Pteridophyta)

   3) Specimen – **F**: Permanent slide/charts/specimen (Gymnosperm)

   4) Specimen – **G**: Permanent slide/charts (Unit – I, II and III)

5. a. *Viva-voce* **05**

   b. Journal **05**

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN-384265

Faculty of Science

B.Sc. Chemistry

Syllabus

Semester-III & IV

W.E.F June-2021 (and thereafter)

CURRICULUM

Hemchandracharya

North Gujarat University,

Patan.

B.Sc. (Chemistry)

(WEF June: 2021)

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General Information of B.Sc Chemistry Semester III & IV
Syllabus According To CBCS Pattern

1. The medium of instruction, question papers as well as answers in examinations will be Gujarati /English. Students are permitted to write answers in English or Gujarati language.

2. Passing standard: 40% as per the revised rules and regulation of Hemchandracharya North Gujarat University, Patan (AK/A×S/6179/2021, Date 29/01/2021).

3. Viva voice will be pertaining to practicals.

4. The result sheet of all semesters will contain the name of elective papers selected by the candidate. The grade and the credit secured.

5. The proposed new courses in chemistry for under graduate classes are reassigned in accordance to semester/CBCS/Grading system with new educational policy. The new course is based on model curriculum of the university grants commission.

Its objectives are as under:

A. To meet the growing demand of specialization and Advanced courses in applied Science.
B. To help the colleges to update and modernize their laboratories.
C. To redesign the courses with special emphasis on local requirements, environment and to link the courses, with requirements of the industries and research.

6. There will be two papers of chemistry are core compulsory and one paper of subject elective in theory and five hours for practical in the University Examination. The pattern will be as follow.

7. This syllabus is to be completed by assigning three periods of one hour each for each paper of theory and two practicals of three hours each per week & the number of students in practical batch should not exceed twenty.

8. The number of students in practical batch in University Examination should not exceed twenty four between two examiners.

9. For semester III the papers; CCCH-301, CCCH-302 are core compulsory. Furthermore, students will have to choice any one of SECH-301A & SECH-301B and Practicals LCCH-301 & LCCH-302.

10. For semester IV the papers; CCCH-401, CCCH-402 are core compulsory. Furthermore, students will have to choice any one of SECH-401A & SECH-401B and Practicals LCCH-401 & LCCH-402.

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CHEMISTRY

B.Sc. Semester: III

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN			
Programme code :	-	Programme Name :	B.Sc.
Faculty :	SCIENCE	Semester :	III
Subject :	CHEMISTRY		
Effective from :	JUNE - 2021		

Sr.	Paper Code	Name of Paper	Credit
1	CC CH - 301	CORE COMPULSORY- CHEMISTRY - I	3
2	CC CH - 302	CORE COMPULSORY- CHEMISTRY - II	3
3	SE CH - 301 A	SUBJECT ELECTIVE - ENVIRONMENTAL POLLUTION	2
	SE CH - 301 B	SUBJECT ELECTIVE - CERAMICS	
4	FC	FOUNDATION COURSE - ENGLISH	2
5	GEC	GENERIC ELECTIVE COURSE	2
6	LC CH - 301	LABORATORY COURSE - I	1.5
7	LC CH - 302	LABORATORY COURSE - II	1.5
8		TWO PAPERS OF SECOND CORE SUBJECT	6
9		TWO PRACTICALS OF SECOND CORE SUBJECT	3
		Total	24

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B.Sc. Semester - III

Chemistry (CC CH : 301)

Unit : I WAVE MECHANICS: (16 Hrs.)

- Black Body Radiation & Quantum Theory.
- Photo electric effect: Wave particle duality of radiation.
- Compton Effect.
- Basic postulates of quantum Mechanics.
- Operator: Definition, Algebra of operators, Addition, Multiplication, Commutative properties, Linear operator, Commutative operators, Laplacian operator
- Free particle System.
- Particle in one dimension box.

Unit : II ACID- BASE PROPERTIES : (16 Hrs.)

- Proton acids – Bases and Lewis acids- Bases.
- Scale of acidity – Basicity.
- Factors effecting on acidity and basicity of compounds.
  - Resonance effect (Drawing resonance structures and the conditions for resonance).
  - Inductive effect
  - Hybridization.
  - Steric effects.
  - Effects by hydrogen bonding.

Unit: III IONIC EQUILIBRIUM (16 Hrs.)

- Only introduction
  Electrolysis, Ionic equilibrium, Resistance, Conductance, Specific Conductance, equivalent Conductance, Molar conductance and equivalent conductance at infinite dilution.
- Transport number: Determination of transport number
  (i) Hittorf's Method
  (ii) Moving Boundary Method.
- Numerical.
- Types of Condctometric titration
  - Acid Base titration:
    1) Strong acid Vs Strong base,
    2) Strong acid Vs Weak base,
    3) Weak acid Vs Strong base,
    4) Weak acid Vs Weak base,
    5) Strong acid + Weak acid Vs Strong base.

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- Hydrolysis of salt:
  Classification of salt
  1) To determine pH equation by hydrolysis of strong acid & weak base Salt.
  2) To determine pH equation by hydrolysis of weak acid & strong base salt.
  3) To determine pH equation by hydrolysis of weak acid & weak base salt.
- Numerical.

Note: The nomenclature of Inorganic and organic compounds should be done as per Recommendation of 2004 IUPAC Draft.

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B.Sc. Semester - III

Chemistry (CC CH : 302)

Unit : I CHEMISTRY OF NOBLE GASES : (16 Hrs.)

- Introduction
- Discovery of Noble gases: Occurrence, Isolation of Non- radioactive of Noble gases.
- Electronic configuration of Noble gases.
- Compound of Noble gases.
    1) Non real compounds prepared by different methods.
    2) True compounds: XeF_2, XeF_4, XeF_6, $XeOF_2$, XeO_2F_2, $XeOF_4$, XeO_3 , XeO_4.

Unit : II ELECTROPHILLIC AROMATIC SUBSTITUTION : (16 Hrs.)

- Introduction.
- Effect of substituent groups.
- Determination of orientation.
- Classification of substituent groups.
- Orientation in disubstitued benzenes.
- Use of Orientation in synthesis.
- Mechanism of Nitration, Sulphonation, Friedel – crafts alkylation and Halogenation.
- Electrophilic aromatic substitution (Two steps).
- Theory of Reactivity & Orientation.
- Electron release via resonance.

Unit: III THERMODYNAMICS : (16 Hrs.)

- Clapeyron equation and its Applications for various phase equilibrium .
- Integrated form of Clapeyron - Clauses equation, and its Applications for various phase equilibrium.
- Traouton's Law.
- Craft equation.
- Boiling point elevation.
- Freezing point depression.
- Partial molar Properties,
  Gibbs duhem equation of Free energy, Entropy, Enthalpy
  Concept of chemical potential Gibbs duhem equation.,
  Duhem margules equation.
  Variation of chemical potential with temperature and pressure.
- Roult's law of ideal solution,
  Vapour pressure of Ideal solutions & Thermodynamics of Ideal solutions.
- Numerical

Note: The nomenclature of Inorganic and organic compounds should be done as per recommendation of 2004 IUPAC Draft.

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REF :

- **Inorganic Chemistry:**

  1. Quantum Chemistry by R.K.Prasad , Revised III[rd] Edition, Page – 3,5,7,34-37,41,65-68.

  2. Concise Inorganic Chemistry J.D.Lee, 4[th] Edition, ELBS publication.

- **Organic Chemistry**

  1. Organic Chemistry by Morrison and Boyd.4[th] ed. Pearson Education-2003
  2. Organic Chemistry by Pine, Hendriction, Cram and Hammond 4[th] ed. By P.S.Kalsi.
  3. Advance Organic Chemistry by Jerry March.
  4. Advance Organic Chemistry by Arun Bahal and B.S.Bahal.
  5. Organic Chemistry Vol. I & II by S.M.Mukherji, S.P.Sing, R.P.Kapoor.
  6. Reaction mechanism and Reagents in Organic Chemistry by Gurdeep R Chatwal 4[th] ed. Himalaya public House.
  7. Text book of Organic Chemistry by Arun Bahal, B.S.Baha , S.Chand.
  8. Organic Spectroscopy by P.S.Kalsi.
  9. Organic Chemistry by I.R.Finar.

- **Physical Chemistry**

  1. Advance Physical Chemistry by Gurdeep Raj
  2. Physical Chemistry (Question and Answers) by R.N.Madan, G.D.Tully, S. Chand.
  3. Principal of Physical Chemistry by Puri, Sharma, Pathania.
  4. Chemical Thermodynamics by R.P.Rastogy and R.R.Mishra.
  5. Essential of Physical Chemistry by B.S.Bahal, Arun Bahal, G.D.Tully.
  6. Physical Chemistry by P.W.Atkins, 5[th] ed., Oxferd 1994 7[th] ed. 2002
  7. Physical Chemistry by R.A.Alberty and R.J.Silbey, John Willey, 1995.
  8. Physical Chemistry by G.H.Barrow, 5[th] ed., Mac Graw Hill, 1998, 6[th] Ed.
  9. Physical Chemistry by W.J.Moore, 4[th] ed., Orient Longmans, 1969.

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B.Sc. Semester - III
Chemistry (SE CH : 301 A)
ENVIRONMENTAL POLLUTION
(Subject Elective)

Unit: I AIR POLLUTION AND WATER POLLUTION (16 Hrs.)

- Introduction
- Classification of pollutant
- Types of pollution What is air pollution
- Source of air pollution
- Acid Rain
- Emissions of major industrial air pollutant
- What is water pollution
- Types of water pollution- Physical & Chemicals , Biological and Physiological
- Source of Water Pollution

Unit: II SOIL, NOISE, THERMAL AND RADIO POLLUTION (16 Hrs.)

- What is soil pollution
- Sources of soil pollution
- Effect of Morden Agro-Technology on Soil
- What is Noise Pollution
- What is Thermal Pollution
- What is Radio Active Pollution
- Prevention of Pollution

REF:-

1. Industrial Chemistry by B. K. Sharma.

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B.Sc. Semester - III

Chemistry (SE CH : 301 B)

CERAMICS

(Subject Elective)

Unit: I CERAMICS : (16 Hrs.)

- Introduction of Ceramics , History – Definition and Industrial uses of Ceramics – Modern Ceramics – Hi-tech ceramics – Sub–division in Ceramics.
- Ceramics bodies,
- Procedures of body preparation,
- Quality testing of raw material,
- Grinding , Sieving and Demagnetizing,
- Filter pressing,
- Dearing pug mill,
- Slip casting & Slip Parameters,
- Finishing & Glazing & Firing,
- Type of kiln

Unit: II CERAMIC PROPERTY MEASUREMENTS & REFRACTORIES : (16 Hrs.)

- Common physical test in ceramics.
- Moisture measurement,
- Grit content,
- Specific density,
- Water of plasticity (WOP),
- Viscosity,
- Dry shrinkage,
- Porosity,
- Water absorption,
- Fired shrinkage,
- Loss of ignition(LOI) & Module of rapture (MOR),
- Crazing test.
- Classification of Refractories,
- Properties and application of Refrectories,
- Manufacturing process of silica bricks.

REF :

1. Industrial ceramics –Felix singer and Sonja S.Singer
2. Ceramic technology and processing – Alan G. king
3. Source book of Ceramics, part-1 – S.Kumar
4. Source book of Ceramics, part-2 – S.Kumar

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B.Sc. Semester - III
Laboratory Course – I & II (Chemistry)

Lab Course: I Inorganic Chemistry :

Inorganic qualitative analysis of mixture containing 4 radicals **(Any Six)**
(Except PO_4^{-3}, BO_3^{-3}, ASO_4^{-3}, ASO_3^{-3}, O^{-2})

Lab Course: II Analytical Chemistry :

Volumetric Analysis of Cu, Zn, Ni and Water (Any Three)

1. To determine the amount of Zn by EDTA method.
2. To determine the amount of Cu by iodometry method.
3. To determine the hardness of water by EDTA method.
4. To determine the amount of Ni^{+2} by back titration method.

Estimations of Glucose, Aniline, and Carboxylic acid: (Any Two)

1. To determine the amount of Aniline by brominating method.
2. To determine the no. of –COOH groups present in a given unknown organic acid.
3. To determine the amount of Glucose by oxidation method.

Chromatography: (Any Two groups)

To determine the Rf values of 1^{st}, 2^{nd} and 3^{rd} groups ions by paper chromatography.

University Exam Pattern for B.Sc. Sem - III : (Two Days per Batch)

Name of Practical	Day	Marks
Lab. Course – I **Inorganic Qualitative**	First day (5 hours)	40 + 5 (viva) = 45
Lab. Course – II **Analytical Chemistry**	Second day (5 hours)	40 + 5 (viva) = 45
	Journal	10
	Total	100

REF:-

1. Advanced practical chemistry, Jagdamba singh, Pragati prakashan
2. A Manual of practical Engineering Chemistry, Dr.M.S.Sudha Jain, S.Chand & Company Ltd.
3. Vogel's Qualitative inorganic Analysis, 7^{th} Edition, G.svehla.

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NAAC 'A' (CGPA) Accredited (State University)

U.G. (B. Sc.) Programme

CBCS :: Semester :: Grading Pattern

With effect from: June 2021

Faculty

Science

Subject

PHYSICS

NEW SYLLABUS / SCHEME

B.Sc. Semesters III & IV

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Choice Based Credit System-Semester-Grading System
In Under Graduate B Sc Programme

B Sc Semester 3 and 4

The 11th Five Year plan of India proposed various measures for academic reforms in higher education. Keeping in view the challenges of the changed times and make the higher education in Indian Universities compatible with the universities in developed nations, the UGC (11th Plan, March 2009) and later on the Association of Indian Universities (AIU) stressed on the following recommendations:

- Semester System
- Choice Based Credit System.
- Curriculum Development
- Examination Reforms
- Administrative Reforms

All the above recommendations for reforms have been reviewed in by representatives of various universities in the Gujarat State and considered for implementation with the aim of transforming Higher Education-**a transformation where students change from being passive recipients of knowledge to becoming active participants of the knowledge imbibing process**. The education system in the State thus changes from a teacher-centric to **learner- centric** mode. It should aim at all-round integral development of students' personality so that they become good citizens of the new world order.

Salient Features of CBCS in UG Programme:

1. Physics subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2021-22.
2. A student will have to get enrolled a **Core course** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting an **Elective** as well as **Foundation** courses from a pool of courses.
3. Each course shall be assigned a specific number of **Credits**.
4. A Core course is the course which should compulsorily be studied by a candidate as a Core requirement so as to get degree in a said discipline of study.
5. There shall be four **Core Compulsory** courses (Theory) each with **3 credits** and their practical's each with **1.5 credits**. Thus, a credit weight-age in Sem-III & IV of **B Sc** programme for each core course shall be of **4.5 credits**. In short, 4.5 credits multiplied by 4 core compulsory courses equal to total of **18 credits**.

6. In addition to the Core courses, a student will have to choose Elective as well as Foundation courses from a pool of courses.

7. **Two** courses of **Elective**, one each from **Generic Elective** and Interdisciplinary / Multidisciplinary
/ Subject centric electives shall have to be offered. The credit weight-age for each Elective course shall be of **02 Credits**. Hence, a total credit weight-age for Elective courses shall be of **4 credits**.

8. One **Foundation** (English Language) course shall have to be offered. The credit weight-age for Foundation course shall be of **02 credits**.

Each course shall have a unique Course code. The Core courses, Elective courses and the Foundation courses shall be abbreviated respectively as **CC, PC, EG, ES and FC.**

1. **Core Compulsory - CC and Practical Core - PC**
2. **Core Compulsory - CC and Practical Core - PC**
3. **Elective Generic - EG and Elective Subject - ES**
4. **Foundation Compulsory- FC**

Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to 90 working days. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.

The course with **4 credits** shall be of **60 hrs** (**15 weeks x 4 credits**) duration. The course with **3 credits** shall be of **45 hrs** (15 weeks x 3 credits) duration. The course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.

A general framework for Bachelor of Science (B Sc) Programme shall be as follows:

Semester wise credits						**Total credits of the Programme**
I	**II**	**III**	**IV**	**V**	**VI**	
24	24	24	24	24	24	**144**

The semester wise weight-age of core, elective and foundation courses shall be as follows:

Academic Year	**Core Compulsory Courses**	**Elective courses**	**Foundation courses**
Semester I & II	65-75%	15-20%	10-15%
Semester III & IV	65-75%	15-20%	10-15%
Semester V & VI	65-75%	15-20%	10 -15%

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Attendance:

The Attendance Rules as per the norms of Hemchandracharya North Gujarat University.

Medium of Instruction:

The Medium of Instruction shall be of **Gujarati medium**. Student is free to write answers either in **Gujarati** or **English** language.

Language of Question paper:

Question paper should be drawn in **Gujarati** language and its **English** version should be given.

Evaluation Methods:

1. A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**) or (**Internal Evaluation**) as well as the **End of Semester examination** (**External Evaluation**). The weight-age of CCA or IA shall be 30%, where as the weight-age of the Semester end examination shall be 70%.

   There will be no internal evaluation in Practical Courses as well as in elective courses.

2. The Semester assessment (**CCA**) or (**Internal Evaluation**) is spread through the duration of the course and is to be done by the Teacher teaching the course. The assessment is to be done by various means including:

   - ✓ Internal Test - 20 Marks
   - ✓ Assignments - 05 Marks
   - ✓ Attendance - 05 Marks

   The performance of student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points. Evaluation for each course shall be done by continuous internal assessment as well as semester end exam and will be consolidated at the end of the course.

3. The **End of Semester examination** (**External Evaluation**) shall have an assessment based upon following perspective with respect to all the courses:

   - ✓ Evaluation with respect to Knowledge
   - ✓ Evaluation with respect to Understanding
   - ✓ Evaluation with respect to Skill
   - ✓ Evaluation with respect to Application

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- ✓ Higher Order Thinking Skills

4. With respect to all the above components, there shall be following types of Questions from each unit of the course.
   - ✓ MCQs/Fill in the blanks/ Match the pairs, etc
   - ✓ Short answer questions /Defenation
   - ✓ Medium answer questions
   - ✓ Long answer questions
   - ✓ Examples/ Problems, etc

5. The End of Semester Examination (Theory) will be conducted by the University. A Certified Journal of the respective core compulsory course shall be produced at the time of practical examination and it must compulsory. In Practical Exam there will be two practicals (each from PC-301 & PC-302) **each of 50 marks** (**35-marks for practical + 15 marks for Viva**) and duration of each practical will be 3 hours. **Numbers of student in a practical exam will be 20 to 24 and Numbers of examiners will be 2.**

   Marking Scheme of B Sc sem 3 and 4 Physics Practicalfor each one

   1. Understanding – Approach – Attitude for Experiment - 10
   2. Observation table with Reading, Unit - 10
   3. Calculation with proper formula and Graph - 08
   4. Accuracy - 02
   5. Viva (Ques related experiment and about basic physics) - 15
   6. Certified Journal - 05

   Total - 50

6. **It will be compulsory for a candidate to obtain passing percentage in both Internal as well as External Evaluation. The passing marks for each course shall be 40%, or as decided by concern Board of Studies of the Subject.**

7. Promotion, Re-Admission and Time for Completion of Course, Procedure for Awarding Grades, Provision for Appeal, etc. as decided by the Hemchandracharya North Gujarat University, Patan.

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NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Programme with 144 credits CBCS-**Semester-Grading Pattern**

w.e.f. June-2021

General Pattern / Scheme of study components along with credits for Science faculty.

Part/ Class	Course	Study Components	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
B. Sc. Sem –III		**Semester-III**					
		Core Compulsory (CC) Course					
	CC-I- 3	Core Course-I (Paper-3)	3	30	70	100	3
	CC-I- 4	Core Course-I (Paper-4)	3	30	70	100	3
	CC-II-3	Core Course-II (Paper-3)	3	30	70	100	3
	CC-II-4	Core Course-II (Paper-4)	3	30	70	100	3
		Practical Core (PC) Course					
	PC-I- 3	Practical Core Course-I (Paper-3)	3		50	50	1.5
	PC-I- 4	Practical Core Course-I (Paper-4)	3		50	50	1.5
	PC-II-3	Practical Core Course-II (Paper-3)	3		50	50	1.5
	PC-II-4	Practical Core Course-II (Paper-4)	3		50	50	1.5
		Foundation Course (FC)					
	FC-3	Foundation **(Generic)** Course – III Compulsory English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EG-3	Elective (**Generic**) Course –III	2	15	35	50	2
	ES-3	Elective (**Subject**) Course –III	2	15	35	50	2
			30	**165**	**585**	**750**	**24**
B. Sc. Sem-IV		**Semester-IV**					
		Core Compulsory (CC)Course					
	CC-I- 5	Core Course-I (Paper-5)	3	30	70	100	3
	CC-I- 6	Core Course-I (Paper-6)	3	30	70	100	3
	CC-II-5	Core Course-II (Paper-5)	3	30	70	100	3
	CC-II-6	Core Course-II (Paper-6)	3	30	70	100	3
		Practical Core (PC) Course					
	PC-I- 5	Practical Core Course-I (Paper-5)	3		50	50	1.5
	PC-I- 6	Practical Core Course-I (Paper-6)	3		50	50	1.5
	PC-II-5	Practical Core Course-II (Paper-5)	3		50	50	1.5
	PC-II-6	Practical Core Course-II (Paper-6)	3		50	50	1.5
		Foundation Course (FC)					
	FC-4	Foundation **(Generic)** Course – IV Compulsory English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EG-4	Elective (**Generic**) Course –IV	2	15	35	50	2
	ES-4	Elective (**Subject**) Course –IV	2	15	35	50	2
			30	**165**	**585**	**750**	**24**

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B.Sc. Programme for semester 3 & 4

(CBCS-Semester-Grading pattern)

Semester end Examination

Format for Question paper **Elective Courses (Subject)** in Physics

w.e.f. June-2021

There will be three questions.
First question will be from Unit - I,
Second question from Unit-II, and
Third question will be from both the Units.

All the questions are detailed as under.

Time: 2Hrs **Total Marks: 35**

1	(a)	Attempt Any One out of Two (Theory questions)	06 Marks
	(b)	Attempt any two Out of Three (Theory type **or** Application/Example/Problem)	06 Marks
2	(a)	Attempt Any One out of Two (Theory questions)	06 Marks
	(b)	Attempt any two Out of Three (Theory type **or** Application/Example/Problem)	06 Marks
3	(a)	Attempt any three out of Five (Short or objective type questions)	06 Marks
	(b)	Attempt any Five Out of Eight (Objective / MCQ)	05 Marks

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B.Sc. Programme for semester 3 & 4

(CBCS-Semester-Grading pattern)

Semester end Examination

Format for Question paper Core Compulsory Courses in Physics

w.e.f. June-2021

There will be four questions. All questions are of 18, 17, 18, 17 marks each.

First question will be from Unit - I, Second question will be from Unit-II,

Third question will be from Unit-III, **Forth question will be from all three Units.**

Detailed about all the questions is as under.

Time: 2.5 Hrs **Total Marks: 70**

1	**(a)**	Answer any One out of Two (Long Theory type questions)	07 Marks
	(b)	Answer any Two Out of Three (Short Note/Application/Example/Problem)	10 Marks
2	**(a)**	Answer any One out of Two (Long Theory type questions)	08 Marks
	(b)	Answer any Two Out of Three (Short Note/Application/Example/Problem)	10 Marks
3	**(a)**	Answer any One out of Two (Long Theory type questions)	07 Marks
	(b)	Answer any Two Out of Three (Short Note/Application/Example/Problem)	10 Marks
4	**(a)**	Answer the following (Any Six out of Eight) (Short answer or objective type questions)	12 Marks
	(b)	Answer the following (Any Five out of Seven) (Very Short answer or MCQ type questions)	06 Marks

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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER III

(PHYSICS SYLLABUS Effective from June - 2021)

CC - PHYSICS - 301

UNIT I THERMODYNAMICS AND SOUND

Heat and Thermodynamics:

Characteristic functions, Enthalpy(11.1), The Helmholtz and Gibb's function(11.2), Two Mathematical Theorems(11.3), Maxwell's equation(11.4), The T dS equations (11.5), Internal-Energy equation(11.6), Heat capacity equation, The Thermal Exapansivity (11.9), Compressibility(11.10), Joule-Kelvin effect (Porous plug Experiment) (12.1) Liquification of Gases by Joule-Kelvin Effect (12.2) ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference: *Heat and Thermodynamics by Mark W. Zeemansky (5th Edition)*

Kinetic Theory of Gases:

Maxewell's Distribution Law of Velocities, Deduction of Maxewell–Boltzmann law, Determination of the values of constants 'a' and 'b' (6.5), Experimental Test of Maxwell's Law (6.6) ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference :

Thermodynamics and Statistical Physics by Singhal – Agarwal - Prakash Pragati Prakashan, Meerut.

Sound : Microphones (20.1), Carbon Microphone(20.2),Condenser Microphone(20.3), Loudspeaker-(i)Fixed coil or moving iron type loudspeaker and (ii) Moving coil type loudspeaker(20.8) Recording of sound : Miller Phonodiek(21.1) ***Related MCQ & Short Questions***

Basic Reference :

A Textbook of oscillations, waves and acoustics by Dr M Ghosh and D Bhattacharya (S Chand)

Other References:

1. University Physics by Sears, Zeemansky and Young. (6th Edi) Narosa publication, New Delhi.
2. Heat Thermodynamics and Statistical Physics by Brijlal, Dr. Subrahmanyam, P.S. Hemne S. Chand.
3. Waves and Oscillations by N Subrahmanyam, Brijlal.

UNIT II ATOMIC PHYSICS

(A) Atomic Spectra: Franck -Hertz Experiment(2.16), Critical Potentials (2.17), Shortcoming of Bohr's Theory(2.19) , Sommerfield extension of Bohr theory (2.20), Limitations of Sommerfield Model ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference: *Atomic and Molecular Physics by Raj Kumar (Campus Books)*

(B) Atomic Spectra :

Orbital and Magnetic Dipole Moment (4.1), Larmor Precession (4.2), Space quantization(4.3), electron spin (4.4), Vector model of atom (4.5), Spectroscopic terms and their notations(4.6), Stern Gerlach Experiment(4.7), Pauli's Exclusion Principle(4.8). Zeeman Effect-Normal Zeeman Effect and anomalous Zeeman Effect(12.1), Explanation of Normal Zeeman Effect(12.2), Explanation of Anomalous Zeeman Effect(12.3), Paschan Back effect (12.4). Stark Effect of Hydrogen (13.1) Weak field and strong field of stark effect in Hydrogen (13.2, 13.3)

Related Examples, Problems, MCQ & Short Questions

Basic Reference: *Atomic & Molecular sprctra by Rajkumar Kedarnath Prakashan Meerut.*

Other Reference:

1. Spectroscopy Vol-1 by Walker & Straw
2. Atomic Physics by J.B. Rajam (5th Edition – 1960) S. Chand & Co.
3. Physics of Atoms and Molecules by B.H.Brandsden & C.J.Joachagh, Pearson Education.
4. Modern Physics by Kenneth Krane, Jon wiley &sons
5 Elements of Spectroscopy S L Gupta, V Kumar & R C Sharma (24th Edition) Pragati Prakashan
6. Molecular Structure and Spectroscopy G Aruldhas, Prentice Hall of India Private Limited

UNIT III SOLID STATE PHYSICS

Crystal Structure:

Crystalline and Amorphous Solid(1.1) , Crystal Lattice and Crystal structure(1.2) , translational Symmetry, Space, Unit Cell and Primitive Cell(1.3), Symmetry Elements in Crystals(1.4-1.4.1 to 1.4.6), The Seven crystal Systems(1.5), Coordination Number(1.5.1), Some important crystal structure(1.6) , Simple Cubic Structure(1.6.1), Body Centered Cubic (BCC) Structure(1.6.2), Face Centered Cubic (FCC) Structure(1.6.3), Wigner-Seitz Cells (1.7), Miller Indices (1.8), The inter planar spacing of crystal planes (1.11). ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference: *Solid State Physics By Ajay Kumar Saxena (Macmillan India Limited)*

Atomic Cohesion and Crystal Binding

Cohesion of Atoms(2.1), Primary Bonds(2.2), The Covalent Bond(2.2.1), The Metalic Bond(2.2.2), The Ionic Bond(2.2.3), Mixed Bond(2.2.4), Secondary Bonds(2.3), The Van-der wall's Bond (2.3.1), The Hydrogen Bond(2.3.2), The Cohesive Energy(2.4), Ionic Crystal-Medalang Energy (2.4.1), Noble Gas Crystal (2.4.2), Atomic Radius and Lattice Constant (2.5), Elastic Constants of Crystals(2.6), Elastic Stress(2.6.1), Elastic Energy Density (2.7.1), Application to Cubic Crystal (2.7.2). ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference : *Elements of Solid State Physics (2003) by J. P. Shrivastav, PHI*

Other Reference :

1. Introduction to solid state Physics By C.Kittle (John Willey)
2. Fundamental of solid state Physics By Saxena, Gupta, Saxena (pragati Prakashan)
3. Solid State Physics By Ajay Kumar Saxena (Macmillan India Limited)
4 Solid State Physics by S O Pillai

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER III

(PHYSICS SYLLABUS : Effective from June - 2021)

CC - PHYSICS – 302

UNIT I ELECTROSTATICS AND MAGNETOSTATICS

(a) Electrostatics in Dielectric :

Introduction to polar and non polar dielectrics, Gaseous Non Polar Dielectrics (2.11), Gaseous Polar Dielectrics (2.12), Non Polar Liquids (2.13), Solid Dielectrics Electrets(2.14), Methods of Electrostatics Images (3.11 i to v) ,

(b) Magnetostatics :

The Magnetic Potential (4.9 - a & b) Magnetic Vector Potential due to small Current Loop(4.12), An Alternative method for finding the Vector Potential A and the field B due to Current Loop(4.13), Magnetization(4.15), Magnetic Field Vector (4.16),Magnetic susceptibility and Permeability (4.17), Boundary Conditions(4.18), Uniformly Magnetized Sphere in External Magnetic Field (4.19), A comparison of Static Electric and Magnetic Field (4.20)

(c) Practical Applications of Electromagnetic Induction :

Use of earth inductor – measurement of Horizontal Component H of the Earth Magnetic Field (12.3-1), Measurement of Vertical Component V of the Earth Magnetic Field using a search coil (12.4). ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference:

1. *Electromagnetics by B.B. Laud, New Age Publisher* ***(For chapt. a & b)***
2. *Electricity and Magnetism by K.K. Tewari, S.Chand.* ***(For Chapt. c)***

Other Reference:

1. Electricity and Magnetism by Mahajan and Rangwala, THM
2. Electricity and Magnetism Berkeley Phy Vol.-II by Edward M Purcell, McGraw-Hill Publi
3. Electricity and Magnetism by D. C. Tayal, Himalaya Publishing House

UNIT II OPTICS

Diffraction: Distinction between Interference and diffraction (17.6), Fresnel and Fraun hoffer types of diffraction(17.7), Fraun hoffer diffraction at a double slit (18.4), Fraunhoffer diffraction at double slit (Calculus method)(18.4.1), Distinct between single slit and double slit diffraction pattern (18.4.2), Fraunhoffer diffraction at N slit(18.6 & 18.6.1), Plane Diffraction Gratting (18.7), Theory of plane transmission gratting (18.7.1), Dispersive power of Grating (18.7.7)
Related Examples, Problems, MCQ & Short Questions

Resolving Power:

Resolving Power of Optical Instrument(19.5), Resolving Power of a telescope(19.7), Relation between magnifying power and resolving power of a telescope(19.7.1).

Related Examples, Problems, MCQ & Short Questions

Polarization:

Introduction(20.1), Polarization by double refraction(20.5.5) , Double refraction(20.8.3), Huygens' explanation of double refraction(20.9 & 20.9.1), Types of Polarized light(20.15),, Retarders or Wave plate (Quarter wave plate) (20.17.1), (Half wave plate)(20.17.2), Production of Elliptically polarized light(20.18), Detection of Elliptically polarized light(20.18.1). ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference:

A text book of OPTICS by Dr. N.Subrahmanyam, Brijlal, Dr, M, N, Avadhanulu - S Chand

Other Reference:

1. A Text book of light by D.N.Vasudev – Atmaram & sons,New Delhi .
2. Fundamentals of Optics by F A Jenkine and H E White Tata McGraw Hill Book Co. Ltd.
3. Optics by Ajoy Ghatak Tata McGraw Hill Book Co. Ltd
4. Principles of Optics by B.K. Mathur

UNIT III ELECTRONICS

Basic Transistors:

(Review of Construction of Transistor) Transistor Current Component(4.18), Detailed Transistor Leakage Currents (4.18-1) (Collector to Base and Collector to Emitter Leakage Current), C-B configuration static (Input and Output)characteristics)(4.09-1), Load Line(4.21), Operating Point(4.22) ***Related Examples, Problems, MCQ & Short Questions***

Transistor Biasing and Stabilization:

Bias Stabilization (Operating Point stabilization) (8.7, 8.7.1 & 8.7.2), Stability factor (8.8), Stabilization by Collector Base Resistance (8.9) Stabilization by potential divider and Emitter resistor (8.10) ***Related Examples, Problems, MCQ & Short Questions***

Basic Transistor Amplifier:

Transistor as four pole (9.2), h-parameters with h-parameters equivalent circuit (9.5 complete), Ground Emitter Circuit – Mathematical analysis using h-parameters only (9.6), Comparative study of three types of Amplifiers(9.9). ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference:

1. *Hand book of Electronics by Gupta & Kumar 30th Revised Edition, 2002 Pragati Prakashan*
2. *Electronics and Radio Engineering by M.L.Gupta (9th Edition-2002) DhanRaj & Sons. (For Ch-(9))*

Other Reference :

1. Electronic Devices and Circuits by A. Mottershead prentice- Hall of India
2. Integrated Electronics by Milliman & Halkias
3. Basic Electronics and Linear Circuits by N. N. Bharagava, D.C.Kulshreshtha, S.C. Gupta.

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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER III

(PHYSICS SYLLABUS : Effective from June - 2021)

Elective Subjective :: PHYSICS : ES - 03
ENERGY TECHNOLOGY

UNIT I

Introduction:

What is energy ?, Energy Science and Technology, Energy, mass and environment, Some well known forms of energy, Energy Resources and forms of energy, Energy demand, Energy Routes for Conventional energy resources, National energy strategies, and energy plan, Energy management, Cost comparission of energy resources and conversion, Energy Conservation opportunities.

Environmental aspects of energy:

Introduction, Polution from use of energy, Conbustation Products of Fossil Fuels, Particulate Matter, Electrostatic Precipitator(ESP), Fabric Filter and Baghhouse.

UNIT-II

Geothermal Energy:

Introduction, Applications, Utilization of Geothermal Energy, Geothermal Energy Resources, Hydro Geothermal Resources, Hot Dry Rock Geothermal Resources. Merits and demerits of Petro-Geothermalenergy Power Plant, Geothermal Electrical Power Plants, Classification and types of Geotermal Power plants,

Wind Energy:

Introduction, Applications of Wind Energy and Historical Background, Merits and limitations of Wind energy Conversion, Nature and Origion of Wind, Wind Energy Quantom, Variables in Wind Energy Conversion systems, Wind power density, Power in wind Stream, Wind turbine Efficiency. Types of wind Turbine-Generator Units, Characteristics of wind turbine generator, Mono-blade HAWT, Twin-blade HAWT

References:

(1) Energy Technology by S.Rao and Dr. B.B. Parulekar, Khanna Pub.-1995 1st edition
(2) Solar Energy conversion, An introductory course By A. E. Dikon and J. D. Loslie
(3) Principles of Energy Conversion By Archie W. Cupl Jr.

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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER III

(PHYSICS SYLLABUS : Effective from June - 2021)

Elective Subjective :: PHYSICS : ES - 04

VACUUM PUMPS, PRESSURE GUAGES AND INSTRUMENTS

UNIT I Vacuum Pumps, Pressure Guages:

Exhaust Pumps and their characteristics(15.1), Rotary Oil Pumps(15.2), Molecular Pump(15.3), Diffusion Pump(15.4), Other methods of Producing Low Pressures(15.5), Pressure Gauges - McLeod Guage, Pirani Guage, Thermocouple Guage, Ionization Gauge,(15.7).

Errors in measurement:

Errors of observations, Types of errors, Normal law of errors, Average, standard and probable errors, Percentage error.

UNIT-II Optical Instruments:

Travelling Microscope, Cathetometer, and Optical bench.

Objective and Eyepiece, Kellner's Eyepiece, Huygens Eyepiece, Ramsden Eyepiece, Comparission of Ramsden Eyepiece and Huygens Eyepiece, Gauss Eyepiece, Telescopes, Refracting Astronomical Telescope, Reflecting Telescope, Newton's Telescope, Other reflecting Telescopes.

Electrical Instruments:

Moving coil Galvanometer, Ballistic Galvanometer, Calibration of Ballistic Galvanometer using different methods, Multimeters, Digital multimeter, Earphone and Headphone. Basic Reference

1. An Advanced Course in Practical Physics by D.Chattopadhyay, P.C. Rakshit, B.SAHA, New Central Book Ltd.
2. A text book of OPTICS by Dr. N, Subrahmanyam, Brijlal, Dr, M,N, Avadhanulu S.Chand.(Ch-10.8 to 10.16)
3. Mechanics by D.S.Mathur **S.**Chand.(For Vacuum pumps)

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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER III

(PHYSICS PRACTICAL SYLLABUS : Effective from June - 2021)

(PC – PHY - 301)

LABORATORY EXPERIMENT

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1) To Find out Viscosity co- efficient of liquid using co-axial viscometer.
સમઅક્ષીય વિસ્કોમીટર ની મદદથી પ્રવાહીનો શ્યાનતા ગુણાંક શોધવો.

2) To determine young modulus 'Y' for metal rod using Kund 's tube .
કુંડ ની નળીની મદદથી ધાતુના સળિયા નો યંગ મોડ્યુલસ શોધવો.

3) To find out the value of e/k using power transistor (PNP →CK 100 or NPN→SL -100).
પાવર ટ્રાન્ઝીસ્ટર ની મદદથી e/k નું મૂલ્ય શોધવું. (PNP→ CK 100 or NPN→ SL -100)

4) To Determine Self Inductance of inductor by Anderson Bridge.
એન્ડરસનબ્રીજ વડે આત્મપ્રેરકત્વ મેળવો.

5) To determination of ' l_0' ,' r ' and ' a ' for resonance pendulum.
અનુનાદ લોલક માટે 'l_0','r' અને'a' મેળવવો.

6) To Determine Unknown Wave Length of Light 'λ' using Hartzmann Formula.
હાર્ટમેનની રીત વડે અજ્ઞાત પ્રકાશની તરંગલંબાઈ શોધવી.

7) To Find out The Refractive Index of Ordinary and Extra Ordinary Rays using Dual Refraction From Calcite Prism. કેલ્સાઈટ પ્રીઝમ(સ્ફટિક)થી દ્વિ વક્રીભવનની ઘટનાનો ઉપયોગ કરી સામાન્ય અને અસામાન્ય કિરણોના વક્રીભવનાંક શોધવા.

8) To Find out The Wave Length of Light using Newton's Rings.
ન્યુટનના વલયોની મદદથી પ્રકાશની તરંગલંબાઈ શોધવી.

જગતની સૌ કેડીઓમાં સ્નેહ સહુથી વડી

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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER III

(PHYSICS PRACTICAL SYLLABUS : Effective from June - 2021)

(PC – PHY - 302)

LABORATORY EXPERIMENT

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1) To determine the Absolute Value of Capacity using B.G or S.G
   B.G ની મદદથી વીજ સંગ્રાહકની નિરપેક્ષ ક્ષમતા શોધવી.

2) Obtain the Characteristics of UJT and Determination of R_{BB} , V_d & η
   UJT નીલાક્ષણીકતાઓ મેળવો અને R_{BB},V_D તેમજη દર્શાવો.

3) To Verify De Morgen's Theorems using IC-7400.
   IC-7400 ની મદદથી દ-મોર્ગનના પ્રમેય ચકાસો.

4) Absorption Co-Efficient of Liquid using Photocell.
   ફોટોસેલની મદદથી પ્રવાહીનો શોષણઆંક શોધવો.

5) Obtain the Characteristics of PNP Common Base Transistor.
   PNP કોમન બેઝ ટ્રાન્ઝીસ્ટરની લાક્ષણીકતાઓ મેળવો.

6) A Study of Characteristics of JFET & Determination of μ, r_d, g_m
   JFETની લાક્ષણીકતાઓ મેળવો અને μ, r_d, g_m દર્શાવો.

7) Construction of AND, OR, NOT Gates Using NAND & NOR Universal Gates.
   યુનિવર્સલ NAND અને NOR ગેટની મદદથી AND, OR અને NOT ગેટ બનાવો.

8) Numerical Analysis (Minimum Class Method)
   સંખ્યાત્મક પૃથ્થકરણ(લઘુત્તમ વર્ગની રીત)

ભૂલો ભલે બીજુ બધુ માબાપને ભુલશો નહિ

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PATAN- 384 265

Modified Detailed Syllabus of CBCS
PROGRAMME Pattern for B. Sc.(Mathematics)
Semester System

PROGRAM CODE : HNGU1054

With Effect from June: 2021

FACULTY : SCIENCE

SUBJECT : MATHEMATICS

CLASS : Bachelor of Science.

SEMESTER : III to IV

TOTAL PAGES : 01 TO 11 (WITH COURSE STRUCTURE)

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Hemchandracharya North Gujarat University, Patan-384265.

B.Sc. (Mathematics): PROGRAMME Structure under CBCS

With Effect from June: 2021

Mission: Our mission is to provide opportunities for developing basic-quality mathematical skills and achievementfor their betterment of life through scientific and technological development.

Learning outcomes: Four major focusing areas: Logical Reasoning & Motivation; Analysis & Problem solving;Information & Technology Proficiency.

Vision: To Motivate Individuals to excel in the mathematical basic knowledge-driven environment of the 21stcentury through curriculum and train integrally human resources through teaching. We **Focus** on quality education.

(1) EDUCATIONAL AIMS:

Mathematics is one of the fundamental disciplines in science. It is the basic for all the disciplines. To makeeducation more effective and learner centric, restructurisation of curriculum becomes essential. As a positive step in this direction and in order to respond to the emerging trends in the global scenario, it is decided to introduce the Choice Based Credit System (CBCS) from the academic year 2011-12 and modified it after three years. Under this system, the academic programme becomes student-oriented, relevant, interdisciplinary and flexible.

(2) CONDITIONS FOR ADMISSION :

A candidate who has passed the H Sec-Science Degree examination of the state or any other examinations accepted by the Syndicate as equivalent thereto shall be eligible for admission to this B ScProgramme in Mathematics on full-time basis of study.

INTAKE rules for admission are as per University notification from time to time.

Students are allowed to take admissions to successive semesters under carry over benefit facility as per the norm decided by the university.

(3) *LEARNING OUTCOMES :*

The programme leading to this degree provides the opportunities to developand demonstrate knowledge and understanding in the following areas:

- **Knowledge and understanding:** When one has completed this degree he/she will haveknowledge and understanding of the fundamental concepts, principles and techniques from a range of topic areas.

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- **Cognitive skills:** When one has completed this degree he/she will be able to understand how to solvesome problems using the methods taught and develop abstract mathematical thinking.

- **Practical skills:** When one has completed this degree, he/she will be able to demonstrate theCommunicate clearly knowledge, ideas and conclusions about mathematics and improve his/her own learning and performance.

(4) DURATION OF THE COURSE:

The CBCS pattern B. Sc. programme with multidisciplinary approach in Mathematics is offered on a full-time basis. The duration of the course is of three academic years consisting of six semesters each of 15 weeks duration.

(5) TEACHING, LEARNING METHODS:

All relevant material is provided and taught in the course texts and through the study of set books. One will build up knowledge gradually, with sufficient in-text examples to support one's understanding. He/She will be able to assess his/her own progress and understanding by using the in-text problems and exercises at the end of each unit in form of practical using computer in computer laboratory.

(6) COURSE OF STUDY :

The curriculum has five major components:

1. *Principle/Core Courses (CC MAT)*
2. *Practical courses (PC MAT)*
3. *Elective Opt. Disciplinary courses (ES MAT)*
4. *Elective Generic course*
5. *Foundation Course*

There are at least 144 Credit COURSEs prescribed in the above classification as per the university norms to be studied to acquire B.Sc. Degree in Mathematics.

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⇛ COURSE STRUCTURE ☒

Course	Courses	Credit /course	Teaching Hrs Total	Total Credits	Examination Internal	Hours	External	Total Marks
SEMESTER-I								
Principle/Core Courses: CC-MAT-111	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-111	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –11 Set Theory & Functions	1	2	2	2	15	2	35	50
Elective Generic	1	2	2	2	15	2	35	50
Foundation Course	1	2	2	2	15	2	35	50
SEMESTER-II								
Principle/Core Courses: CC-MAT-122	1	4	4	4	30	2.5	70	100
Practical/ PC MAT-122	1	2	4	2	-	5	50	50
Elective Opt. Disciplinary: ESMAT –21 Industrial Mathematics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	50	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-III								
Principle/Core Courses: CC-MAT-301	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-302	1	3	3	3	30	2.5	70	100
Practical /PC- MAT-301	1	1.5	3	1.5	-	5	50	50
Practical /PC -MAT-302	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –31 Numerical Solution of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-IV								
Principle/Core Courses: CC-MAT-401	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-402	1	3	3	3	30	2.5	70	100
Practical/ PC- MAT-401	1	1.5	3	1.5	-	5	50	50

Practical/ PC MATH-402	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –41 Improper Intrgrals	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-V								
Principle/Core Courses: CC-MAT-501	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-502	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-503	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-504	1	3	3	3	30	2.5	70	100
Practical/PC MAT-501	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-502	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-503	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-504	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ESMAT –51 Theory of Equations	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50
SEMESTER-VI								
Principle/Core Courses: CC-MAT-601	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-602	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-603	1	3	3	3	30	2.5	70	100
Principle/Core Courses: CC-MAT-604	1	3	3	3	30	2.5	70	100
Practical/PC MAT-601	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-602	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-603	1	1.5	3	1.5	-	5	50	50
Practical/PC MAT-604	1	1.5	3	1.5	-	5	50	50
Elective Opt. Disciplinary: ES-MAT –61 Business Statistics	1	2	2	2	15	2	35	50
Elective generic	1	2	2	2	15	2	35	50
Foundation course	1	2	2	2	15	2	35	50

N.B.: *Work-loaddepends on the number of students and the number of Batches/Groups ,forPractical and Cognitive-skill based Course.*

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B.Sc. (Mathematics) Semester-4

CC-MAT-401 Integral Calculus

Unit-01 **Riemann integral:**
Upper, lower Riemann integral for a function of one variable defined over [a,b], Riemann integral and its properties, fundamental theorem of calculus, mean value theorem, change of variable.

Unit-02 **Improper Integral and Multiple Integral:**
Repeated integral, double integral, integral on non-rectangular region, transformation to polar co-ordinate, change of order of integration, triple integration, and transformation to polar and cylindrical co-ordinate.

Unit-03 **Vector analysis, line and surface integral:**
[**Revision** (*not for Examination*)**:** Gradient of scalar functions, divergence and curl of vector functions]
Line integral, surface integral, Green's theorem, Stock's theorem and its applications

- **Textbook:**
  Integral Calculus, Shantinarayan S. Chand, New Delhi (Course Book)

- **Reference Book:**
  1. Advanced Calculus, D V Widder , Prentice Hall , New Delhi
  2. Advanced Calculus Vol : I & II, T M Apostol, Blaisdoll
  3. Advanced Calculus, R C Buck, MacMillan

CC-MAT-402: Linear Algebra

Unit-01 **Vector spaces:**
Vector space, subspace, span of set, more about subspaces, linearly dependent and independent, dimension and basis.

Unit-02 **Matrix and linear transformations:**
Definition of linear transformation, range and kernel of a linear map, rank and nullity, rank-nullity theorem, inverse of linear transformation, definition of matrix of linear transformation, linear transformation associated with matrix and matrix associate with linear transformation, the dimension of $L(U,V)$and its determination, rank and nullity of a matrix.

Unit-03 **Inner product space:**
Definition of inner product space, norm, orthogonality, Schwarz's and triangular inequality, parallelogram law, orthonormal basis, Gram-Schmidt orthogonilization process (without proof) and its applications, Eigen value and Eigen vector of a linear transformation, characteristic polynomial, Caley-Hamilton theorem and its applications.

- **Textbook:**
  An Introduction to Linear Algebra' by V. Krishnamurthy, V P Mainra, J L Arora, Affiliated East-west Press Pvt. Ltd., New Delhi.
- **Reference Books:**

1. Linear Algebra , Ramchandra Rao, P. Bhimasankar, Tata MacGrawHill
2. Topics in Algebra, I N Herstein, Wiley Eastern Ltd
3. Linear Algebra, S K Berberion, Oxford University Press
4. Linear Algebra Problem Book, P R Holmos, Cambridge University Press
5. Linera Algebra, Sharma and Vashishtha, Krishna Prakashan, Meerut
6. Linear Algebra, Gupta K P, PragatiPrakashan, Meerut
7. Linear Algebra, G Paria, New Central book agency Ltd, Calcutta.

PC –MAT-401 Practicals on Integral Calculus

1. To find the inverse of a Linear transformation
2. To find composition of linear maps
3. Applications of Range and Kernel of a linear map
4. Application of Rank Nullity theorem
5. Applications of Matrix associated with linear transformation
6. Applications of Linear map associated with matrix
7. Verifications on Rank-Nullity theorem
8. Application of Gram Schmidt orthonormalization process
9. Applications of Cayley-Hamilton Theorem
10. Application of line integral
11. Applications of surface integral
12. Application of Green's Theorem
13. Application of Stokes' theorem
14. Application of divergence theorems

PC–MAT-402 PRACTICALS OF LINEAR ALGEBRA

1. Applications of Vector spaces
2. Applications of Subspaces
3. Applications of Basis and Dimension of vector spaces
4. Applications of expansion of linearly independent set up to a basis of a vector space
5. Verification on Dimension theorem
6. Applications of Linear transformations
7. To find the inverse of a linear transformation
8. To find composition of linear maps
9. Applications of Range and Kernel of a linear map
10. Application of Rank Nullity theorem
11. Applications of Matrix associated with linear transformation
12. Applications of Linear map associated with matrix
13. Verifications on Rank-Nullity theorem
14. Application of Gram Schmidt orthonormalization process
15. Applications of Cayley-Hamilton Theorem.

[Practicals should be conducted with the help of either scientific Calculator or appropriate software like Python, MATLAB, SciLab]

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ES-MAT-41: Improper Integral

Unit-1 **Gamma Function:**

Definitions of Gamma function and its properties, Applications of gamma functions, several forms of Gamma functions

Unit-2 **Beta Function:**

Definition of Beta functions and its properties, Applications of Beta functions, Relation between Beta and Gamma function, several forms of Beta functions

- **Reference Books :**

1. Advanced Calculus, D V Widder , Prentice Hall , New Delhi
2. Advanced Calculus Vol : I & II, T M Apostol, Blaisdoll
3. Advanced Calculus, R C Buck, MacMillan

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હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in Website : www.ngu.ac.in

પરિપત્ર ક્રમાંક – ૧૬૮ / ૨૦૨૧

વિષયઃ વિજ્ઞાન વિદ્યાશાખાના સ્નાતક કક્ષાના નવા અભ્યાસક્રમો અંગે...

આ યુનિવર્સિટી સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાએ કરેલ ભલામણ અનુસાર નીચેના વિષયોના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો **જૂન – ૨૦૨૧ થી ક્રમશઃ અમલ માં આવે તે રીતે** એકેડેમિક કાઉન્સિલએ તેની તા. ૦૯/૦૬/૨૦૨૧ ની સભા ના નિર્દિષ્ટ ઠરાવો થી મંજૂર કરેલ છે. જેનો અમલ કરવા સારૂ સંબંધિતોને આ સાથે મોકલવામાં આવે છે, જેનો ચુસ્ત અમલ થવા વિનંતી છે.

ક્રમનં.	અભ્યાસક્રમ	એકેડેમિક સભાના ઠરાવક્રમાંક	સેમેસ્ટર	પાના નંબર
૧	બાયોટેકનોલોજી	૨૬	સેમ.–૩ થી ૬	૧ થી ૩૯
૨	વનસ્પતિશાસ્ત્ર	૨૭	સેમ.–૩ અને ૪	૧ થી ૩૪
૩	ભૌતિકશાસ્ત્ર	૨૯	સેમ.–૩ અને ૪	૧થી ૨૩
૪	રસાયણશાસ્ત્ર	૩૦	સેમ.–૩ અને ૪	૧ થી ૧૯

આ બાબતની સંબંધિત અધ્યાપકો તથા વિદ્યાર્થીઓને આપના સ્તરેથી જાણ કરવા વિનંતી છે.

નોંધઃ (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજ ના ગ્રંથાલયમાં મૂકવાની રહેશે.
(૨) આ અભ્યાસક્રમ યુનિવર્સિટીની વેબ સાઈટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરાવવામાં આવનાર છે.

સહી/–
અધ્યક્ષ

બિડાણઃ ઉપર મુજબ

કુલસચિવવતી

નં.–એ કે / અ× સ / ૧૪૭૫ / ૨૦૨૧
તારીખ : ૨૧ / ૦૬ / ૨૦૨૧

પ્રતિ,

૧. અધ્યક્ષશ્રી/ કો.ઓર્ડીનેટરશ્રી –વિજ્ઞાન વિદ્યાશાખા અંતર્ગત અનુસ્નાતક વિભાગો, હેમ. ઉ.ગુ. યુનિવર્સિટી, પાટણ.
૨. સંલગ્ન સાયન્સ કોલેજોના આચાર્યશ્રીઓ
૩. ડૉ. જગદીશ એચ. પ્રજાપતિ (ડીનશ્રી – વિજ્ઞાન વિદ્યાશાખા),સરકારી સાયન્સ કોલેજ, **થરાદ.** જિ. બનાસકાંઠા
૪. વિજ્ઞાન વિદ્યાશાખા હેઠળના વિષયોની અભ્યાસ સમિતિઓના ચેરમેનશ્રીઓ.
૫. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (પાંચ નકલ)
૬. ઈનચાર્જ ઓફિસરશ્રી, સબસેન્ટર, ખેડબ્રહ્મા કેમ્પસ, મુ. વડાલી , જિ. સાબરકાંઠા. (હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, **પાટણ.)**
૭. ગ્રંથપાલશ્રી, હેમ.ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ. (વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઈલ માટે)
૮. સીસ્ટમ એનાલીસ્ટ, કોમ્પ્યુટર(રીઝલ્ટ) સેન્ટર, હેમ.ઉ.ગુ. યુનિવર્સિટી,પાટણ તરફ વેબસાઈટ પર મૂકવા સારૂ.
૯. પ્રવેશ પ્રશાખા(એકેડેમિક શાખા) હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ.
૧૦. મુખ્ય હિસાબી અધિકારીશ્રી (મહેકમ), હેમ. ઉત્તર ગુજરાત યુનિવર્સિટી, પાટણ તરફ– પરિપત્રની ફાઈલ અર્થે
૧૧. સિલેકટ ફાઈલે– (૨ નકલ)

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B.SC. BIOTECHNOLOGY SEM 4 SYLLABUS

w.e.f June 2021

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B.Sc Semester IV

Biotechnology

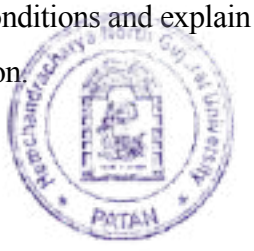
Principles of metabolism II

Semester IV

BT-401

Learning Outcomes:

1. Describe the distinct metabolic pathways used by cells to harvest the energy stored in glucose under aerobic conditions.
2. Know the specific locations of these pathways in a generalized eukaryotic cell.
3. Understand the chemical relationship between the glucose molecules used by cells as fuel and the carbon dioxide generated by the same cells as waste.
4. Trace the path of high-energy electrons from glucose to water in aerobic respiration.
5. Describe glycolysis in general terms, including the molecules that exist at its start and its end, as well as its net versus total ATP production.
6. Explain how the electron transport chain uses the high energy electrons harvested originally from glucose to provide the direct source of energy used by ATP synthase to make ATP.
7. Explain why the NADH produced in glycolysis and the NADH and FADH2 produced in the Krebs cycle differ from one other in the amount of energy they provide for the production ATP by oxidative phosphorylation.
8. Understand how proteins and fats are metabolized.
9. Compare the number of ATPs produced in the degradation of carbohydrates, proteins, and fats.
10. Compare the overall amount of ATP produced by the complete metabolic breakdown of one molecule of glucose under aerobic conditions with the ATP produced from the breakdown of one glucose molecule under anaerobic conditions.
11. Describe how the NADH molecules produced during glycolysis are oxidized back to NAD+ under aerobic and anaerobic conditions and explain why this oxidation is important to glucose metabolism and ATP production.



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12. Describe fermentation in plant and animal cells and explain the importance of this process in terms of energy harvest and ATP production.
13. Compare and contrast the various secondary metabolites described in the chapter

Unit I Glucose metabolism

1.1 glycolysis
1.2 Fate of pyruvate under aerobic and anaerobic condition
1.3 Alcohol and lactic acid fermentation.
1.4 Gluconeogenesis
1.5 Pentose Phosphate pathway

Unit II Lipd, amino acid and nucleotide metabolism

2.1 Fatty acid catabolism: beta oxidation

2.2 Fatty acid biosyntesis.

2.3 Overview of amino acid metabolism, urea cycle.

2.4 Overview of nucleotide metabolism

Unit III Oxidative phosphorylation

3.1 Concept of standard redox potential l and redox potential

3.2 Electron carriers of mitochondrial ETS

3.3 Complexes of mitochondrial Electron Transport System (ETS)

3.4 Chemo-osmotic hypothesis for ATP synthesis.

Unit IV Photosynthesis

4.1 Pigments involved in photochemical phase of photosynthesis.

4.2 Cyclic and noncyclic electron flow during light reaction of photosynthesis.

4.3 Biosynthetic phase of photosynthesis: Calvin cycle, photorespiration.

4.4 Biosynthetic phase of photosynthesis: C4 pathway.

B.Sc Semester IV

Biotechnology

Food biotechnology and microbial disease

Semester IV

BT-402

Learning Outcomes:

1. Analyse the importance of microorganisms in foods and understand the biotic and abiotic factors that affect their development in these substrates.
2. Analyse, summarise, resolve problems and make professional decisions.
3. Apply the scientific method to resolving problems.
4. Design experiments and interpret the results.
5. Develop individual learning strategies and planning and organisation skills.
6. Evaluate the behaviour of reactors depending on their operating mode.
7. Recognise the importance of fermentation processes and appreciate the role of microorganisms in industrial processes.
8. Relate the characteristics of foods to their physical properties.
9. Show sensitivity to environmental, sanitary and social issues.
10. Understand the different types of microbial diseases
11. Agents responsible for spreading microbial diseases
12. Prevention and control of microbial types of diseases
13. Treatment available to cure different microbial diseases

Unit 1

1.1 Use of microorganisms in preparation of various food products.

1.2 fermented dairy products

1.3 Different fermented food products

1.4 Pro biotics

Unit 2

2.1 spoilage of food: spoilage of vegetables, meat, egg

2.2 food preservation: principles.

2.3 chemical and physical methods of food preservation

Unit 3

3.1 Microbial pathogenesis**:**

3.2. Key bacterial diseases.

3.3 important viral diseses.

3.4 Examples of fungal disuse.

Unit 4

4.1 Introduction of terms: Sterilization, Disinfection, Antisep tic, Germicide, Chemotherapy, Antibiotic etc.

4.2 **Physical agent:** Mode of action and application of Temperature. Radiation and Filtration.

4.3 **Chemical agent**: Mode of action and application of Phenol, alcoholic and halogen compounds.

4.4 **Chemical agent:** Mode of action and application of Heavy metal and Gaseous agent

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B.Sc Semester IV

Biotechnology: Subjective elective

Plant growth regulators

Semester IV

BT-ES-1

Learning Outcomes:

1. Understand the structure and properties of each plant hormone
2. Understand the plant hormones and their roles in plant development
3. Understand physiological responses produced by plants against environmental stresse
4. Understand the physiological effects of plant hormones in plants

Unit -1 plant growth regulators-1

1. Definition: types and discovery of various PGR
2. Auxin and its derivatives.
3. Gibberellins and its applications.
4. Cytokinins (= Kinins),

Unit -2 Plant growth regulators 2

1. General growth inhibitors: Acid and ehelene
2. Application of PGR in plant tissue culture
3. Oligosaccharins and Other Natural Growth Hormones In Plants

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B.Sc. Semester IV

Biotechnology: Subjective elective

Basic of Forensic Science

Semester IV

BT-ES-2

Learning Outcomes:

1. The detail study will help to understand about the basics and different branches of Forensic Sciences.
2. Will help to know about the working and functioning of Forensic science laboratories.
3. Will learn the Police science its role in criminal investigation and Prevention of crime

Unit -1 Fundamentals of Forensic Science

1. Introduction and principles of forensic science
2. Role of biotechnology in forensic science
3. Tools and design of forensic biotechnology laboratory
4. Isolation of DNA from sample of crime scene

Unit -2 Techniques of Forensic Biotechnology

1. DNA Fingerprinting/RFLP for solving crime
2. PCR: principle, method and application in forensic science
3. DNA profiling for forensic medicine
4. Ethics, rules related to forensic sciences

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B.Sc Semester IV

Biotechnology

Semester IV

Practicals

1. MBRT of milk samples
2. Isolation of any bacteria from food sample.
3. Isolation of spoilage microorganism from spoiled vegetable.
4. Preparation of pro biotic product
5. Study the effect of Chemicals
6. Study the effect of Heavy metal,
7. Study the effect of Antibiotics
8. Lipid estimation
9. Amino acid estimation
10. Quantification of DNA.
11. Urea estimation by DAM

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FACULTY OF SCIENCE

B.Sc. BOTANY

Semesters: IV

SYLLABUS

Curriculum as per UGC Guideline

With Semester/CBCS/Grading Pattern

With effect from June - 2021 (and thereafter)

DATE: June, 2021

TOTAL PAGE: 19

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U.G. (B.Sc.) Programme

CBCS:: Semester :: Grading Pattern

With effect from: June - 2021

FACULTY OF SCIENCE

Subject: BOTANY

B. Sc. Semesters: IV

Total Pages: 01 to 19

Submitted on
Date: 07/04/2021

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SUMMARY OF THE PROGRAMME

Summary of the Programme	
✓ Syllabus duration	Semester pattern i.e., **Six** months
✓ *No. of core compulsory (CC) course*	***02*** *(in each semester)*
✓ *Credits per CC course*	*03*
✓ *Total credits for CC course*	***06****/Semester*
✓ *Theory lectures per CC course*	*03 /week*
✓ *Total Theory lectures for CC course*	*06 /week*
✓ No. of Practical courses per semester	**02**
✓ Practical lectures	03 /week/course/batch
✓ Total Practical lectures	06 /week/ batch
✓ Credits per Practical course	**1.5**
✓ Total Credits of Practical course	**03** /Semester
✓ No. of Practical course (in Uni. Exam.)	**02** /Semester
✓ No. of Elective Subjective (ES) course	**01** (in each semester)
✓ Credits for ES course	**02** (in each semester)
✓ Theory lectures per ES course	02/week
✓ No. of Elective Generic (EG) course	**01**
✓ Credits for EG course	**02**
✓ Theory lectures per EG course	02/week
✓ Examination (including Preparation)(weeks)	05
✓ No. of Days per week	06
✓ Weeks (days) available for Teaching	**15** (90)
✓ Duration of each lecture (minutes)	55
✓ No. of students/batch	**20** (on approval of AC and Exam. unit)

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Under Choice **B**ased **C**redit **S**ystem-Semester-Grading System pattern

U G (B. Sc.) Programme in Botany

Semester - IV

Salient Features:

- CBCS in UG programme in **Botany Semester IV shall** be offered from the Academic year **June 2021**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2021-22.
- A student will have to get enrolled a **Core course** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting an **Elective** as well as **Foundation** courses from a pool of courses.
- Each course shall be assigned a specific number of **Credits**.
- A Core course is the course which should compulsorily be studied by a candidate as a Core requirement so as to get degree in a said discipline of study.
- There shall be **Two Core Compulsory** courses (Theory) each with **3 credits** in each semester and their practical's each with **1.5 credits**. Thus, a credit weight-age in **B.Sc.** programme for each semester core course shall be of **6 credits**. In short, **9** credits multiplied by **2** subjects equal to total of **18 credits**.
- In addition to the Core courses, a student will have to choose Elective as well as Foundation courses from a pool of courses.
- **Two** courses of **Elective**, one each from **Generic Elective** and Interdisciplinary / Multidisciplinary / **Subject centric electives** shall have to be offered. The credit weight-age for each Elective course shall be of **02 Credits**. Hence, a total credit weight-age for Elective courses shall be of **4 credits**.
- One **Foundation** (English Language L.L.) course shall have to be offered. The credit weight-age for Foundation course shall be of **02 credits**.
- Each course shall have a unique Course code. The Core courses, Elective courses and the Foundation courses shall be abbreviated respectively as **CC, PC, EG, ES and FC.**

1. Core Compulsory **CC**

   Practical Core (Core Elective) **PC**
2. Elective Generic **EG**

   Elective Subject **ES**
3. Foundation Compulsory **FC**

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- Each Academic year shall consist of **two** semesters, each of **15weeks** of teaching equivalent to 90 working days. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.
- The course with **4 credits** shall be of **60 hrs** (15 weeks x 4 credits) duration. The course with **3 credits shall** be of **45 hrs** (15 weeks x 3 credits) duration. The course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.
- **A general framework for Bachelor of Science (B.Sc.) programme shall be as follows:**

Semester wise credits						Total credits of the Programme
I	**II**	**III**	**IV**	**V**	**VI**	
24	24	24	24	24	24	**144**

- **The semester wise weight age of core, elective and foundation courses shall be as follows:**

Academic year	Core compulsory Courses	Elective courses	Foundation courses
Semester I & II	65-75%	15-20%	10-15%
Semester III & IV	65-75%	15-20%	10-15%
Semester V & VI	65-75%	15-20%	10-15%

- **Attendance:**

  The Attendance Rules as per the norms of Hemchandracharya North Gujarat University.

- **Medium of Instruction:**
- The Medium of Instruction shall be of **Gujarati** and/or **English medium**.
- Student is free to write answers either in **Gujarati** and/or **English** language.
- **Language of Question paper:**

  Question paper should be drawn in **Gujarati** language and its **English** version should be given.

- **Evaluation Methods:**

  Academic performance in various courses *i.e.* core, discipline electives, generic electives and skill enhancement courses are to be considered as parameters for assessing the achievement of students in botany. A number of appropriate assessment methods of

botany will be used to determine the extent to which students demonstrate desired learning outcomes. Following assessment methodology should be adopted;

1. The oral and written examinations (Scheduled and surprise tests).
2. Closed-book and open-book tests.
3. Problem-solving exercises.
4. Practical assignments and laboratory reports.
5. Observation of practical skills.
6. Individual and group project reports.
7. Efficient delivery using seminar presentations.
8. Viva voce interviews are majorly adopted assessment methods for this curriculum.
9. The computerized adaptive testing, literature surveys and evaluations, peers and self-assessment, outputs form individual and collaborative work are also other important approaches for assessment purposes.
10. A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**)/ (**Internal Evaluation**) as well as the **End of Semester examination** (**External Evaluation**). The weight-age of CCA shall be 30%, whereas the weight-age of the Semester end examination shall be 70%. There will be **no internal evaluation in practical courses.**
11. In Semester assessment (**CCA**)/ (**Internal Evaluation**) is spread through the duration of the course and is to be done by the Teacher teaching the course. BoS of the subjects will decide various criteria and their weight-age for CCA. The assessment is to be done by various means including:
    - ✓ Written Tests
    - ✓ MCQs based Tests/Quiz
    - ✓ Presentations/Seminars
    - ✓ Project work/Field work
    - ✓ Group discussions/Group activities
    - ✓ Assignments, etc.
12. The distribution of **Internal Evaluation** is given as per criteria given below for **30** marks:

    Written Test… **20** marks,

    Assignments/MCQs/Very Short questions… **05** marks and Attendance and Regularity, Punctuality… **05** marks.

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13. The **End of Semester examination** (**External Evaluation**) shall have an assessment based upon following perspective with respect to all the courses:
    a. Evaluation with respect to Knowledge
    b. Evaluation with respect to Understanding
    c. Evaluation with respect to Skill
    d. Evaluation with respect to Application
    e. Higher Order Thinking Skills
14. With respect to all the above components, there shall be following types of Questions from each unit of the course.
    a. MCQs/Fill in the blanks/ Match the pairs, etc
    b. Short answer questions
    c. Medium answer questions
    d. Long answer questions
    e. Examples/ Problems, etc.
15. The End of Semester Examination will be conducted by the University. A certified journal of the respective practical course **must be produced** at the time of practical examination by the student.
16. It will be compulsory for a candidate to obtain passing percentage in both Internal as well as External Evaluation. The passing marks for each course shall be **40%** as decided by concern Board of Studies in Botany.
17. Promotion, Re-Admission and Time for Completion of Course, Procedure for Awarding Grades, Provision for Appeal, etc. as decided by the Hemchandracharya North Gujarat University.

STUDY TOUR:

Botanical excursion/study tour may be arranged (by the concern faculty with prior permission of **HoD and/or Principal**) within state and/or outside the state to explore/study plant diversity in its natural habitats.

SUBMISSION:

Instead of submission of Herbarium sheets and/or specimens at the time of final (Uni.) practical examination student may submit photographs/ drawings/ charts/ models or CD having such photographs/drawings of plant species to conserve plant species in their natural habitats and to avoid any damage to plant species and its natural habitat.

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ELECTIVE (SUBJECTIVE) COURSE:

For semester- IV a list of course is given below.

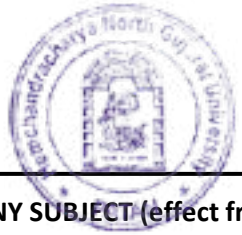
1. **Elective (Subject) Course :: ES BOT-401 :: Plant Breeding**

SELECTION OF ELECTIVE (GENERIC) COURSE:

- For semester-III and IV a separate consists of courses is offered by university. Students may select **any one** of them from offered courses in Semester-III and Semester-IV separately.

AIMS:

1. To transform curriculum into outcome-oriented scenario.
2. To develop the curriculum for fostering discovery-learning.
3. To equip the students in solving the practical problems pertinent to India.
4. To adopt recent pedagogical trends in education including e-learning, flipped class, hybrid learning and MOOCs.
5. To mold responsible citizen for nation-building and transforming the country towards the future.
6. To provide an environment that ensures cognitive development of students in a holistic manner. A dialogue about plants and its significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects.
7. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
8. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
9. To enable the graduate prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination.



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B. Sc. Semester-IV

CC-BOT-401: Anatomy of Angiosperms

LEARNING OUTCOMES: ***On completion of this course, the students will be able to:***

- Develop an understanding of concepts and fundamentals of plant anatomy examine the internal anatomy of plant systems and organs.
- Develop critical understanding on the evolution of concept of organization of shoot and root apex.
- Analyze the composition of different parts of plants and their relationships.
- Evaluate the adaptive and protective systems of plants.

CC–BOT-402: Economic Botany

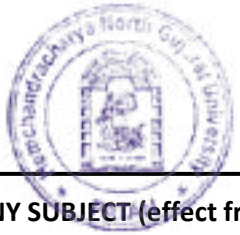
LEARNING OUTCOMES: On completion of this course, the students will be able to:

- Understand core concepts of Economic Botany and relate with environment, populations, communities, and ecosystems.
- Develop critical understanding on the evolution of concept of organization of apex new crops/varieties, importance of germplasm diversity, issues related to access and ownership.
- Develop a basic knowledge of taxonomic diversity and important families of useful plants.
- Increase the awareness and appreciation of plants & plant products encountered in everyday life.
- Appreciate the diversity of plants and the plant products in human use.

ES-BOT-401: **Plant Breeding**

LEARNING OUTCOME: On completion of the course, the students will be able to:

- Develop conceptual understanding of plant genetic resources, plant breeding, gene bank and gene pool.
- Familiarize with genetic basis of heterosis.
- Classify Sexual and Asexual modes of reproduction.
- Explain monogenic and polygenic inheritance.
- Reflect upon the role of various non- conventional methods used in crop improvement.



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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc. Programme with 144 credits CBCS-Semester-Grading Pattern

w.e.f. June-2021

General Pattern/Scheme of study components along with credits for Science faculty.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN						
B.Sc. three year (General) Programme with 144 credits Semester-III and IV in BOTANY w.e.f. June-2021						
General Pattern/Scheme of study components along with credits						
Study Components		**Ins. Hrs/ Week**	**Examination**			**Credit**
			Internal Marks	**Uni. Exam.** Marks	**Total** Marks	
Semester-III						
	Core Compulsory (CC) Course					
CC-I-3	Core Course-I (Paper-3)	3	30	70	100	**3**
CC-I-4	Core Course-I (Paper-4)	3	30	70	100	**3**
CC-II-3	Core Course-II (Paper-3)	3	30	70	100	**3**
CC-II-4	Core Course-II (Paper-4)	3	30	70	100	**3**
	Soft-skill: Practical Core (PC) Course					
PC-I-3	Practical Core Course-I (Paper-3)	3		50	50	**1.5**
PC-I-4	Practical Core Course-I (Paper-4)	3		50	50	**1.5**
PC-II-3	Practical Core Course-II (Paper-3)	3		50	50	**1.5**
PC-II-4	Practical Core Course-II (Paper-4)	3		50	50	**1.5**
	Foundation Course (FC)					
FG-21	Compulsory English (L.L.)	2	15	35	50	**2**
	Elective Course (EC)					
EG-21	Elective (Generic) Course	2	15	35	50	**2**
ES-21	Elective (Subject) Course	2	15	35	50	**2**
		30	**165**	**585**	**750**	**24**
Semester-IV						
	Core Compulsory (CC) Course					
CC-I-5	Core Course-I (Paper-5)	3	30	70	100	**3**
CC-I-6	Core Course-I (Paper-6)	3	30	70	100	**3**
CC-II-5	Core Course-II (Paper-5)	3	30	70	100	**3**
CC-II-6	Core Course-II (Paper-6)	3	30	70	100	**3**
	Soft-skill: Practical Core (PC) Course					
PC-I-3	Practical Core Course-I (Paper-5)	3		50	50	**1.5**
PC-I-4	Practical Core Course-I (Paper-6)	3		50	50	**1.5**
PC-II-3	Practical Core Course-II (Paper-5)	3		50	50	**1.5**
PC-II-4	Practical Core Course-II (Paper-6)	3		50	50	**1.5**
	Foundation Course (FC)					
FG-21	Compulsory English (L.L.)	2	15	35	50	**2**
	Elective Course (EC)					
EG-21	Elective (Generic) Course	2	15	35	50	**2**
ES-21	Elective (Subject) Course	2	15	35	50	**2**
		30	**165**	**585**	**750**	**24**

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc Programme (CBCS - Semester - Grading Pattern)

B. Sc.:: BOTANY :: SEMESTER END EXAMINATION

Format for Questions paper Core Compulsory Course in Botany

(B.Sc. Sem. – IV)

(W.E.F. JUNE - 2021)

The university examination paper consists of four questions.

- First question is of 20 marks and will be from Unit – I.
- Second question is of 20 marks and will be from Unit – II.
- Third question is of 20 marks and will be from Unit – III.
- Fourth question is of 10 marks and will be from Unit – I TO IV.

Time: 2.5 Hrs **Total Marks: 70**

1. Long answered and medium answered/short note-typed questions from Unit-I 18
a. Long answered questions (Attempt any **two** from **three** each of **5** marks)
b. Medium answered or short note-typed questions (Attempt any **two** from **three** each of **4** marks)

2. Long answered and medium answered/short note-typed questions from Unit-II 17
a. Long answered questions (Attempt any **two** from **three** each of **5**marks)
b. Medium answered or short note-typed questions (Attempt any **two** from **three** , 4+3 marks)

3. Long answered and medium answered/short note-typed questions from Unit-III 18
a. Long answered questions (Attempt any **two** from **three** each of **5** marks)
b. Medium answered or short note-typed questions (Attempt any **two** from **three** , 4+3 marks)

4. a. Answer the following questions (any six out of eight) 12
(Objective type short questions)
b. Answer the following questions (any 5 out of seven) 05
(MCQs)

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Programme (CBCS - Semester - Grading Pattern)

B. Sc.:: BOTANY :: SEMESTER END EXAMINATION

Format for Questions paper Elective Course in Botany

(B.Sc. Sem – IV)

(W.E.F. JUNE - 2021)

The university examination paper consists of three questions.

- First question is of 12 marks and will be from Unit – I.
- Second question is of 12 marks and will be from Unit – II.
- Third question is of 11 marks and will be from Unit – I & II.

Time: 2 Hrs **Total Marks: 35**

Q.1 (a) Attempt any one out of two. 06 Marks

(b) Attempt any two out of three. 06 Marks

Q.2 (a) Attempt any one out of two. 06 Marks

(b) Attempt any two out of three. 06 Marks

Q.3 (a) Attempt any three out of five (SQ). 06 Marks

(b) Attempt any five out of eight. 05 Marks

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B. Sc. Semester-IV

Botany :: CC-BOT-401

Anatomy of Angiosperms

(Credits: Theory-3, Practical-1.5)

Theory Lectures: 54

Unit 1: Anatomy (18 lectures)

- The three tissue systems, types of cells and tissues.
- Classification of tissues; Simple and complex tissues; tracheary elements and sieve elements.
- Types of vascular bundles; Structure of dicot & monocot stem and leaf.
- Ergastic substances (starch grains of Potato & Wheat, Aleurone layer of Maize, Aleurone crystal of Castor seed), Hydathodes, Cavities, Cystolith and Laticifers.

Unit 2: Meristems (18 Lectures)

Definition & characteristics of meristem, Evolution concept of organization of shoot apex (Apical cell theory, Histogen theory and Tunica Corpus theory).

- Organization of root apex (Histogen theory, Korper-Kappe theory and Quiescent centre theory).
- Epidermal tissue system; cuticle, epicuticular waxes.
- Trichomes (Uni-and Multicellular, Glandular and Nonglandular, two examples of each), Stomata: types, location, structure & function, classification (Metcalfe and Chalk).

Unit 3: Secondary growth (18 Lectures)

- Structure, function and activity of cambium; Secondary growth definition and types-normal and anomalous.
- Secondary growth in **Sunflower** stem and root.
- Anomalous Secondary growth in ***Salvadora*** stem and ***Tinospora*** aerial root.
- Sapwood and heartwood; Ring and diffuse porous wood; Tyloses, Periderm and Lenticels.

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B. Sc. Semester-IV

Botany :: PC-BOT-401

Anatomy of Angiosperms

Practicals:

1. Study of anatomical details through permanent slides/temporary stain mounts/ macerations/ museum specimens with the help of suitable examples.

2. Ergastic substances (Aleurone layer of Maize, Aleurone crystal of Castor seed), Hydathodes, Cavities, Cystolith (*Ficus* leaf).

3. Apical meristem of root and shoot.

4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings (Sunflower & *Cucurbita* stem).

5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood (chart).

6. Phloem: Sieve tubes-sieve plates; companion cells (***Cucurbita*** stem).

7. Epidermal system: stomata types (Dicot & Monocot); trichomes: non-glandular (*Abutilon*/Cotton), glandular (*Ocimum*), Periderm (PS) & Lenticels (PS).

8. Root: Secondary growth (Sunflower root & aerial root of *Tinospora*).

9. Stem: secondary growth (Sunflower & *Salvadora* stem).

Suggested Readings

1. Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
2. Fahn, A. (1974). Plant Anatomy. Pergmon Press, USA.
3. Mauseth, J.D. (1988). Plant Anatomy. The Benjammin/Cummings Publisher, USA.
4. Evert, R.F. (2006) Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc.

B. Sc. Semester-IV

Botany :: CC-BOT-402

Economic Botany

(Credits: Theory-3, Practical-1.5)

Theory Lectures: 54

Unit 1: Plant Resources-1 (18 lectures)

- Introduction of plant resources.
- Concept of centres of origin, their importance with reference to Vavilov's work.
- Classification of economic important plants based on their uses.
- Origin, morphology, processing and uses of **Wheat** and **Rice**, Brief account of **millets**.

Unit 2: Plant Resources- 2 (18 lectures)

- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Chick pea** and **Pigeon pea**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Potato**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of spices: **Clove** and **Black Pepper**.
- Morphology and processing of **Sugarcane**, products and by-products of sugarcane industry.

Unit 3: **Plant Resources- 3** (18 lectures)

- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Groundnut** and **Mustard**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Fennel**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Tea**.
- Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Cotton** and **Jute**.

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B. Sc. Semester-IV

Botany :: PC-BOT-402

Economic Botany

Practicals:

Write Scientific name, Family, Useful part, Chemical constitutes, economic important and draw labelled diagram of plant:

1. **Cereals:**
   - **Wheat** (habit sketch, starch grains, micro-chemical tests).
   - **Rice** (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).
2. **Legumes:**
   - **Chick pea** and **Pigeon pea** (habit, fruit, seed structure, micro-chemical tests).
3. **Sources of oils and fats:**
   - **Mustard** and **Groundnut** –plant specimen, seeds; tests for fats in crushed seeds.
4. **Sources of sugars and starches:**
   - **Sugarcane**
   - **Potato**: Potato tuber morphology, w.m. starch grains, Iodine test).
5. **Spices:**
   - **Black pepper** (habit),
   - **Fennel** (habit) and
   - **Clove** (habit).
6. **Beverages:**
   - **Tea** (plant specimen and tea leaves).
7. **Fiber-yielding plants:**
   - **Cotton** (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose),
   - **Jute** (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).

Suggested Readings

1. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
2. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
3. Chrispeels, M.J. and Sadava, D.E. 1994 Plants, Genes and Agriculture. Jones & Bartlett Publishers.

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CBCS - Semester - Grading Pattern

B. Sc.:: BOTANY :: SEMESTER-IV

ES -BOT-401 :: Plant Breeding

(Credits: Theory-2)

Theory Lectures: 30

(Effective from June 2021)

Unit 1: Plant Breeding **(15 lectures)**

- Introduction, definition and objectives of plant breeding.
- Breeding systems: modes of reproduction in crop plants.
- Important achievements and undesirable consequences of plant breeding.
- Vegetatively propagated plants – Procedure, advantages and limitations.

Unit 2: Inbreeding depression and heterosis **(15 lectures)**

- History, genetic basis of inbreeding depression and heterosis; Applications.
- Selection methods: Mass selection and Pure line selection.
- Hybridization procedure
- Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.

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CBCS - Semester - Grading Pattern

B. Sc. :: BOTANY Practical :: SEMESTER-IV

PC-BOT-401

(Effective from June-2021)

Date: **Place:**

Time: 5 Hrs **Total Marks: 50**

Instructions: Strictly follow the instructions given by examiner(s).

1. Show _____ from plant material **A** stain if necessary with appropriate staining. Draw labelled diagram and show your preparation to the examiner (Unit 1). **08**

2. Expose and mount _____ from given material **B** stain if necessary show your Preparation to your examiner (Unit 2). **08**

3. Make a temporary stained preparation of specimen **C** for secondary growth. Draw labelled Diagram and show your preparation to the examiner (Unit 3). **08**

4. Identify and describe the anatomical structure observed in **16**
   1) Specimen – **D**: Permanent slide/charts (Unit – I)
   2) Specimen – **E**: Permanent slide/charts (Unit – II)
   3) Specimen – **F**: Permanent slide/charts (Unit – III)
   4) Specimen – **G**: Permanent slide/charts (Unit – I, II and III)

5. a. *Viva-voce* **05**
   b. Journal **05**

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B. Sc. :: BOTANY Practical :: SEMESTER-IV

PC-BOT-402

(Effective from June 2021)

Date: **Place:**

Time: 5 Hrs **Total Marks: 50**

Instructions: Strictly follow the instructions given by examiner(s).

1. Perform the micro chemical tests for detection of organic molecule (Starch grain) in given sample **A** and describe the plant in details containing this molecule. Show your result to the examiner. **08**

2. Perform the micro chemical tests for detection of organic molecule (Legume protein) in given sample **B** and describe the plant in details containing this molecule. Show your result to the examiner. **08**

3. Perform the micro chemical tests for detection of organic molecule (Fats, Lignin, and Cellulose) in given sample **C** and describe the plant in details containing this molecule. Show your result to the examiner. **08**

4. Identify and write scientific name, family, useful part, economic important and draw labelled diagram (except Que: 1,2 & 3): **16**
   1. Specimen – **D**
   2. Specimen – **E**
   3. Specimen – **F**
   4. Specimen – **G**

5. a. *Viva-voce* **05**
   b. Journal **05**

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN-384265

Faculty of Science

B.Sc. Chemistry

Syllabus

Semester-III & IV

W.E.F June-2021 (and thereafter)

CURRICULUM

Hemchandracharya

North Gujarat University,

Patan.

B.Sc. (Chemistry)

(WEF June: 2021)

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North Gujarat University
PATAN

General Information of B.Sc Chemistry Semester III & IV
Syllabus According To CBCS Pattern

1. The medium of instruction, question papers as well as answers in examinations will be Gujarati /English. Students are permitted to write answers in English or Gujarati language.

2. Passing standard: 40% as per the revised rules and regulation of Hemchandracharya North Gujarat University, Patan (AK/A×S/6179/2021, Date 29/01/2021).

3. Viva voice will be pertaining to practicals.

4. The result sheet of all semesters will contain the name of elective papers selected by the candidate. The grade and the credit secured.

5. The proposed new courses in chemistry for under graduate classes are reassigned in accordance to semester/CBCS/Grading system with new educational policy. The new course is based on model curriculum of the university grants commission.

Its objectives are as under:

A. To meet the growing demand of specialization and Advanced courses in applied Science.
B. To help the colleges to update and modernize their laboratories.
C. To redesign the courses with special emphasis on local requirements, environment and to link the courses, with requirements of the industries and research.

6. There will be two papers of chemistry are core compulsory and one paper of subject elective in theory and five hours for practical in the University Examination. The pattern will be as follow.

7. This syllabus is to be completed by assigning three periods of one hour each for each paper of theory and two practicals of three hours each per week & the number of students in practical batch should not exceed twenty.

8. The number of students in practical batch in University Examination should not exceed twenty four between two examiners.

9. For semester III the papers; CCCH-301, CCCH-302 are core compulsory. Furthermore, students will have to choice any one of SECH-301A & SECH-301B and Practicals LCCH-301 & LCCH-302.

10. For semester IV the papers; CCCH-401, CCCH-402 are core compulsory. Furthermore, students will have to choice any one of SECH-401A & SECH-401B and Practicals LCCH-401 & LCCH-402.

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CHEMISTRY

B.Sc. Semester: IV

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN			
Programme code :	-	Programme Name :	B.Sc.
Faculty :	SCIENCE	Semester :	IV
Subject :	CHEMISTRY		
Effective from :	June- 2021		

Sr.	Paper Code	Name of Paper	Credit
1	CC CH - 401	CORE COMPULSORY- CHEMISTRY - I	3
2	CC CH - 402	CORE COMPULSORY- CHEMISTRY - II	3
3	SE CH - 401 A	SUBJECT ELECTIVE - NAME REACTIONS	2
	SE CH - 401 B	SUBJECT ELECTIVE - GREEN CHEMISTRY	
4	FC	FOUNDATION COURSE - ENGLISH	2
5	GEC	GENERIC ELECTIVE	2
6	LC CH - 401	LABORATORY COURSE - I	1.5
7	LC CH - 402	LABORATORY COURSE - II	1.5
8		TWO PAPERS OF SECOND CORE SUBJECT	6
9		TWO PRACTICALS OF SECOND CORE SUBJECT	3
		Total	24

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Semester: III & IV

CHEMISTRY SYLLABUS

(Effective from June 2021)

This syllabus is to be completed by assigning three period of one hour each for core course, two period of one hour each for subject Elective course. And two practical's of three hours each per week. The number of students in a practical batch should not exceed twenty four.

PATTERN OF EXAMINATION:

There will be two papers for core compulsory and one paper for subject elective theory and five hours/day for two days per batch Practicals in the university examination. The pattern of examination will be as follows.

Theory & practical Exam	Time Duration	Marks External	Marks Internal
Core course - I	2.5 hours	70	30
Core course – II	2.5 hours	70	30
Subject elective course	2 hours	35	15
Laboratory course - I	5 hours	50	……
Laboratory course - II	5 hours	50	……

Theory Examination Pattern: (For Core Papers)

Time : 2.5 hrs. **Total Marks : 70**

Que. No: 1	Write any Two out of Three Questions	18 Marks
Que. No: 2	Write any Two out of Three Questions	17 Marks
Que. No: 3	Write any Two out of Three Questions	18 Marks
Que. No: 4	Write any Two out of Three Questions	17 Marks

Theory Examination Pattern: (For Elective Papers)

Time : 2 hrs. **Total Marks : 35**

Que. No: 1	Write any Two out of Three Questions	18 Marks
Que. No: 2	Write any Two out of Three Questions	17 Marks

Note: If there are more than one concept or style of question are present in any paper or any unit like as theory and examples and when that both type of the questions will be compulsory to attend by students, than paper setter can ask different way like.. a & b sub questions with internal option, in the place of the style shown above.

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B.Sc. Semester - IV

Chemistry (CC CH : 401)

Unit 1: CFT & Co-Ordination Compounds (16 Hrs.)

(A) CRYSTAL FIELD THEORY :

- Splinting of d-orbitals Oh and Td
- Application of CFT:
  - For determination of colour of complexes
  - Use of CFSE Value.
- Limitation of CFT
- Isomerism in complexes
- Low spin and high spin complexes.

(B) MAGNETIC PROPERTIES OF CO-ORDINATION COMPOUNDS :

- Type of magnetic behavior
- Method of determining magnetic susceptibility.
- Spin only formula.
- Magnetic properties for 3rd metal complexes.

Unit 2 : CARBOHYDRATES : (16 Hrs)

- Introduction
- Classification and nomenclature of Mono Saccharides.
- Reactions of Glucose and Fructose.
  (Methylation, Acetylation, Oxidation with Br_2 water and Conc. HNO_3 , Reaction with HCN , NH_2OH , $C_6H_5NHNH_2$, Osazone formation and Epimerization.)
- Lengthening of carbon chain of aldoses.
- Shortening of carbon chain of aldoses.
- Configuration of Aldo Hexoses [D (+) Glucose] , Hemi acetal and acetal forms, Cyclic structure of D(+) glucose, Mechanism of mutarotation , cyclic structure of D(-) fructose (only introduction about structure) , Determination of ring size of Aldo hexose .
- Inter conversions of
  (1) Glucose from Fructose (2) Fructose from Glucose
  (3) Glucose from Manose (4) Manose from Glucose
  (5) Glucose from Arabinose (6) Arabinose from Glucose

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Unit: III PHYSICAL PROPERTIES OF LIQUID: (16 Hrs)

- Vapour pressure,
- Surface tension,
  (1) Measurement and Application of surface tension by Stalagmometer
  (2) Perachore and its applications.
- Viscosity
  (1) Measurement and Application of viscosity by Ostwald viscometer.
- Refractive index
  (1) Specific refraction
  (2) Molar refraction
  (3) Measurement and Application of Refractive index by abbe's Refractometer.
- Optical activity
  (1) Measurement and Application of optical activity by Polari meter.
- Dipole moment and its measurement and its applications.
- Numerical.

Note: The nomenclature of Inorganic and organic compounds should be done as per Recommendation of 2004 IUPAC Draft.

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B.Sc. Semester - IV

Chemistry (CC CH : 402)

Unit1: BORON HYDRIDE: (16 Hrs)

- Introduction
- Classification of hydrides.
- Preparation, properties structure and use of Diborone.
- Bridge bonding in B_2H_6 (M.O. and sp^3 approach).
- Structure of higher Borones: B_4H_{10}, B_5H_9, B_5H_{11}, B_6H_{10}, $B_{10}H_{14}$.

Unit 2: ULTRAVIOLET SPECTROSCOPY : (16 Hrs)

- Type of electronic transitions.
- Effect of conjugation.
- Concept of Chrmophores and Auxochromes.
- Bathochromic, Hypsochromic, Hyper chromic, and Hypochromic shifts.
- Woodward – Fisher rules.
- Problems of conjugated enes, enones and aromatic ketones, aldehydes, acids and esters using empirical rules.

Unit 3: PHASE RULE: (16 Hrs)

- Gibbs Phase rule- statement and meaning of terms- phase, component, degree of freedom,
- Derivation of phase rule,
- Advantages and limitations of phase rule,
- One component system
    1) water system,
    2) Sulphur system,
- Reduced phase rule of condensed system,
- Two component system:
    1) Pb - Ag system,
    2) Zn - Mg system,
    3) KI - water system,
- Dehydration of $CuSO_4 \cdot 5H_2O$
- Steam distillation
- Numerical.

Note: The nomenclature of Inorganic and organic compounds should be done as per Recommendation of 2004 IUPAC Draft.

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REF:-

- **Inorganic Chemistry:**

1. Inorganic Chemistry by James e. Huheey "Fourth Edition"
2. Advance Inorganic Chemistry- Satya prakash. G.D.Tuli, S.K.Basu, R.D.Madan, S.Chand Vol-II.
3. Advance Inorganic Chemistry - Satya prakash, S.Chand, Vol-I.PAGE NO-819-828.

- **Organic Chemistry:**

1. Organic Chemistry by Morrison and Boyd.4th ed. Pearson Education-2003
2. Organic Chemistry by Pine, Hendriction , Cram and Hammond 4th ed. By P.S.Kalsi.
3. Advance Organic Chemistry by Jerry March.
4. Advance Organic Chemistry by Arun Bahal and B.S.Bahal.
5. Organic Chemistry Vol. I & II by S.M.Mukherji, S.P.Sing, R.P.Kapoor.
6. Reaction mechanism and Reagents in Organic Chemistry by Gurdeep R Chatwal 4th ed. Himalaya public House.
7. Text book of Organic Chemistry by Arun Bahal , B.S.Bahal , S.Chand.
8. Spectroscopy of Organic Compounds 6th Ed. By P.S.Kalsi.
9. Organic Chemistry by I.R.Finar.
10. Organic Spectroscopy by Williams and Kemp.
11. Spectroscopic Methods in Organic Chemistry by Dubey H.Williams and Ian Fleming.

- **Physical Chemistry**

1. Advance Physical Chemistry by Gurdeep Raj
2. Physical Chemistry (Question and Answers) by R.N.Madan, G.D.Tully, S. Chand.
3. Principal of Physical Chemistry by Puri, Sharma, Pathania.
4. Chemical Thermodynamics by R.P.Rastogy and R.R.Mishra.
5. Essential of Physical Chemistry by B.S.Bahal , Arun Bahal , G.D.Tully.
6. Physical Chemistry by P.W.Atkins, 5th ed. , Oxferd 1994 7th ed. 2002
7. Physical Chemistry by R.A.Alberty and R.J.Silbey, John Willey , 1995.
8. Physical Chemistry by G.H.Barrow, 5th ed., Mac Graw Hill, 1998, 6th ed.
9. Physical Chemistry by W.J.Moore, 4th ed., Orient Longmans, 1969.

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B.Sc. Semester - IV
Chemistry (SE CH : 401 A)
NAME REACTIONS
(Subject Elective)

Unit – I: Name Reactions -I : (16 Hrs)

Mechanism, Synthesis and applications

- Arndt – Eistert Reaction.
- Hofmann Rearrangement.
- Aldol Condensation.
- Diels – Alder Reaction.
- Riemann tiemann reaction

Unit – II: Name Reactions -II (16 Hrs)

Mechanism, Synthesis and applications

- Dickmann Condensation.
- Mannich Reaction.
- Clemmensen Reduction
- Wolff kishner Reduction
- Dakin Oxidation.

REF :-

1. Name Reaction by Prof. G.S.Kapadia, Uni.Granth Nirman Board.
2. Name Reaction by Jie Jack Li, Springer International Edition.
3. Reaction Mechanism and Reagents in Organic Chemistry by G.R.Chatwal.

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B.Sc. Semester - IV
Chemistry (SE CH: 401 B)
GREEN CHEMISTRY
(Subject Elective)

Unit I: BASICS OF GREEN CHEMISTRY: (16 Hrs)

- The need for green Chemistry.
- Eco-efficiency-environmental protection laws,
- Challenges – pollution control and pollution,
- Green methods, green products, recycling of wastes
- Twelve principles of green chemistry,
- Inception of green chemistry-awards for green chemistry,
- International organizations promoting green chemistry.

Unit: II: DESIGNING GREEN SYNTHESIS (16 Hrs)

- Choice of starting materials, choice of reagents, choice of catalysts.
- Bio catalysts, polymer supported catalysts, choice of solvents.
- Synthesis involving basic principles of green chemistry.
- Examples – adipic acid, catechol, methyl methacrylate, urethane, aromatic amines (4-aminodiphenylamine), benzyl bromide, acetaldehyde, citral, ibuprofen, Paracetamol.

REF :

1. V.K.Ahluwalia & M.R.Kidwai : New Trends in Green Chemistry, Anamalaya Publishers (2005).
2. V.Kumar, An Introduction to Green Chemistry, Vishal Publishing Co.Jalandhar, 2007.
3. Sanghi A Shrivastav Green Chemistry

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B.Sc Semester - IV

Laboratory Course – I & II (Chemistry)

Lab Course : I Organic Chemistry

Separation of Organic Mixture : **(Any Six)**
Mixture Containing Two Compounds (Only Water Insoluble Solid Compounds)

Lab Course : II Physical Chemistry :

Condctometer:

1) To determine the cell constant by KCl solution and to determine the normality and amount of HCl / CH_3COOH Vs NaOH.

P^H - meter

1) To determine the normality and amount of HCl Vs NaOH.
2) Determine the Dissociation constant of the acid of mixtures of CH_3COONa and CH_3COOH by determine the P^H.

Refractometer (Any One)

1) Determine the specific refraction and molar refraction of the given liquid A, B, and mixture C (A+B) and calculate the percentage composition of A and B in the mixture C by Abbe's Refractometer.
2) Determine the molar refraction of $CH_3COOC_2H_5$, $CH_3COOC_3H_7$ and $CH_3COOC_4H_9$ and show the constancy of reaction equivalent of – CH_2 - Group by Abbe's Refractometer.

Viscometer:

1) To determine the viscosity of liquid A, B and Mixture C (A+B) and determine the percentage composition of A and B in the mixture C by graphical method.

Stalagmometer: (Any One)

1) To determine the surface tension and compare cleaning – efficiency of two samples of a detergent or soap with stalagmo meter.
2) Determine the surface tension of the given liquid A, B, and mixture C (A+B) and Calculate the percentage of A and B in the mixture C.

Chemical Kinetics: (Any One)

1) Finding the relative strength of HCl and H_2SO_4 from the Catalytic method. (finding the relative strength of two acids by hydrolysis of methyl acetate)
2) Determining the degree of hydrolysis between Urea and HCl by Catalytic method.

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University Exam Pattern for B.Sc Sem - IV : (Two Days per Batch)

Name of Practical	Day	Marks
Lab. Course – I **Organic Seperation**	First day (5 hours)	40 + 5(viva) = 45
Lab. Course – II **Physical Chemistry**	Second day (5 hours)	40 + 5(viva) = 45
	Journal	10
	Total	100

REF:-

1. Advanced practical chemistry, Jagdamba Singh, Pragati prakashan
2. A Manual of practical Engineering Chemistry, Dr.M.S.Sudha Jain, S.Chand & Company Ltd.
3. Vogel's Qualitative inorganic Analysis, 7th Edition, G.svehla

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NAAC 'A' (CGPA) Accredited (State University)

U.G. (B. Sc.) Programme

CBCS :: Semester :: Grading Pattern

With effect from: June 2021

Faculty

Science

Subject

PHYSICS

NEW SYLLABUS / SCHEME

B.Sc. Semesters III & IV

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Choice Based Credit System-Semester-Grading System
In Under Graduate B Sc Programme

B Sc Semester 3 and 4

The 11th Five Year plan of India proposed various measures for academic reforms in higher education. Keeping in view the challenges of the changed times and make the higher education in Indian Universities compatible with the universities in developed nations, the UGC (11th Plan, March 2009) and later on the Association of Indian Universities (AIU) stressed on the following recommendations:

- Semester System
- Choice Based Credit System.
- Curriculum Development
- Examination Reforms
- Administrative Reforms

All the above recommendations for reforms have been reviewed in by representatives of various universities in the Gujarat State and considered for implementation with the aim of transforming Higher Education-**a transformation where students change from being passive recipients of knowledge to becoming active participants of the knowledge imbibing process**. The education system in the State thus changes from a teacher-centric to **learner- centric** mode. It should aim at all-round integral development of students' personality so that they become good citizens of the new world order.

Salient Features of CBCS in UG Programme:

1. Physics subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2021-22.
2. A student will have to get enrolled a **Core course** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting an **Elective** as well as **Foundation** courses from a pool of courses.
3. Each course shall be assigned a specific number of **Credits**.
4. A Core course is the course which should compulsorily be studied by a candidate as a Core requirement so as to get degree in a said discipline of study.
5. There shall be four **Core Compulsory** courses (Theory) each with **3 credits** and their practical's each with **1.5 credits**. Thus, a credit weight-age in Sem-III & IV of **B Sc** programme for each core course shall be of **4.5 credits**. In short, 4.5 credits multiplied by 4 core compulsory courses equal to total of **18 credits**.

6. In addition to the Core courses, a student will have to choose Elective as well as Foundation courses from a pool of courses.

7. **Two** courses of **Elective**, one each from **Generic Elective** and Interdisciplinary / Multidisciplinary
/ Subject centric electives shall have to be offered. The credit weight-age for each Elective course shall be of **02 Credits**. Hence, a total credit weight-age for Elective courses shall be of **4 credits**.

8. One **Foundation** (English Language) course shall have to be offered. The credit weight-age for Foundation course shall be of **02 credits**.

Each course shall have a unique Course code. The Core courses, Elective courses and the Foundation courses shall be abbreviated respectively as **CC, PC, EG, ES and FC.**

1. **Core Compulsory - CC and Practical Core - PC**
2. **Core Compulsory - CC and Practical Core - PC**
3. **Elective Generic - EG and Elective Subject - ES**
4. **Foundation Compulsory- FC**

Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to 90 working days. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.

The course with **4 credits** shall be of **60 hrs** (**15 weeks x 4 credits**) duration. The course with **3 credits** shall be of **45 hrs** (15 weeks x 3 credits) duration. The course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.

A general framework for Bachelor of Science (B Sc) Programme shall be as follows:

Semester wise credits						**Total credits of the Programme**
I	**II**	**III**	**IV**	**V**	**VI**	
24	24	24	24	24	24	**144**

The semester wise weight-age of core, elective and foundation courses shall be as follows:

Academic Year	**Core Compulsory Courses**	**Elective courses**	**Foundation courses**
Semester I & II	65-75%	15-20%	10-15%
Semester III & IV	65-75%	15-20%	10-15%
Semester V & VI	65-75%	15-20%	10 -15%

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Attendance:

The Attendance Rules as per the norms of Hemchandracharya North Gujarat University.

Medium of Instruction:

The Medium of Instruction shall be of **Gujarati medium**. Student is free to write answers either in **Gujarati** or **English** language.

Language of Question paper:

Question paper should be drawn in **Gujarati** language and its **English** version should be given.

Evaluation Methods:

1. A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**) or (**Internal Evaluation**) as well as the **End of Semester examination** (**External Evaluation**). The weight-age of CCA or IA shall be 30%, where as the weight-age of the Semester end examination shall be 70%.

   There will be no internal evaluation in Practical Courses as well as in elective courses.

2. The Semester assessment (**CCA**) or (**Internal Evaluation**) is spread through the duration of the course and is to be done by the Teacher teaching the course. The assessment is to be done by various means including:

   - ✓ Internal Test - 20 Marks
   - ✓ Assignments - 05 Marks
   - ✓ Attendance - 05 Marks

   The performance of student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points. Evaluation for each course shall be done by continuous internal assessment as well as semester end exam and will be consolidated at the end of the course.

3. The **End of Semester examination** (**External Evaluation**) shall have an assessment based upon following perspective with respect to all the courses:

   - ✓ Evaluation with respect to Knowledge
   - ✓ Evaluation with respect to Understanding
   - ✓ Evaluation with respect to Skill
   - ✓ Evaluation with respect to Application

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- ✓ Higher Order Thinking Skills

4. With respect to all the above components, there shall be following types of Questions from each unit of the course.
   - ✓ MCQs/Fill in the blanks/ Match the pairs, etc
   - ✓ Short answer questions /Defenation
   - ✓ Medium answer questions
   - ✓ Long answer questions
   - ✓ Examples/ Problems, etc

5. The End of Semester Examination (Theory) will be conducted by the University. A Certified Journal of the respective core compulsory course shall be produced at the time of practical examination and it must compulsory. In Practical Exam there will be two practicals (each from PC-301 & PC-302) **each of 50 marks** (**35-marks for practical + 15 marks for Viva**) and duration of each practical will be 3 hours. **Numbers of student in a practical exam will be 20 to 24 and Numbers of examiners will be 2.**

   Marking Scheme of B Sc sem 3 and 4 Physics Practicalfor each one

   1. Understanding – Approach – Attitude for Experiment - 10
   2. Observation table with Reading, Unit - 10
   3. Calculation with proper formula and Graph - 08
   4. Accuracy - 02
   5. Viva (Ques related experiment and about basic physics) - 15
   6. Certified Journal - 05

   Total - 50

6. **It will be compulsory for a candidate to obtain passing percentage in both Internal as well as External Evaluation. The passing marks for each course shall be 40%, or as decided by concern Board of Studies of the Subject.**

7. Promotion, Re-Admission and Time for Completion of Course, Procedure for Awarding Grades, Provision for Appeal, etc. as decided by the Hemchandracharya North Gujarat University, Patan.

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NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Programme with 144 credits CBCS-**Semester-Grading Pattern**

w.e.f. June-2021

General Pattern / Scheme of study components along with credits for Science faculty.

Part/ Class	Course	Study Components	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
B. Sc. Sem –III		**Semester-III**					
		Core Compulsory (CC) Course					
	CC-I- 3	Core Course-I (Paper-3)	3	30	70	100	3
	CC-I- 4	Core Course-I (Paper-4)	3	30	70	100	3
	CC-II-3	Core Course-II (Paper-3)	3	30	70	100	3
	CC-II-4	Core Course-II (Paper-4)	3	30	70	100	3
		Practical Core (PC) Course					
	PC-I- 3	Practical Core Course-I (Paper-3)	3		50	50	1.5
	PC-I- 4	Practical Core Course-I (Paper-4)	3		50	50	1.5
	PC-II-3	Practical Core Course-II (Paper-3)	3		50	50	1.5
	PC-II-4	Practical Core Course-II (Paper-4)	3		50	50	1.5
		Foundation Course (FC)					
	FC-3	Foundation **(Generic)** Course – III Compulsory English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EG-3	Elective (**Generic**) Course –III	2	15	35	50	2
	ES-3	Elective (**Subject**) Course –III	2	15	35	50	2
			30	**165**	**585**	**750**	**24**
B. Sc. Sem-IV		**Semester-IV**					
		Core Compulsory (CC)Course					
	CC-I- 5	Core Course-I (Paper-5)	3	30	70	100	3
	CC-I- 6	Core Course-I (Paper-6)	3	30	70	100	3
	CC-II-5	Core Course-II (Paper-5)	3	30	70	100	3
	CC-II-6	Core Course-II (Paper-6)	3	30	70	100	3
		Practical Core (PC) Course					
	PC-I- 5	Practical Core Course-I (Paper-5)	3		50	50	1.5
	PC-I- 6	Practical Core Course-I (Paper-6)	3		50	50	1.5
	PC-II-5	Practical Core Course-II (Paper-5)	3		50	50	1.5
	PC-II-6	Practical Core Course-II (Paper-6)	3		50	50	1.5
		Foundation Course (FC)					
	FC-4	Foundation **(Generic)** Course – IV Compulsory English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EG-4	Elective (**Generic**) Course –IV	2	15	35	50	2
	ES-4	Elective (**Subject**) Course –IV	2	15	35	50	2
			30	**165**	**585**	**750**	**24**

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B.Sc. Programme for semester 3 & 4

(CBCS-Semester-Grading pattern)

Semester end Examination

Format for Question paper **Elective Courses (Subject)** in Physics

w.e.f. June-2021

There will be three questions.
First question will be from Unit - I,
Second question from Unit-II, and
Third question will be from both the Units.

All the questions are detailed as under.

Time: 2Hrs **Total Marks: 35**

1	(a)	Attempt Any One out of Two (Theory questions)	06 Marks
	(b)	Attempt any two Out of Three (Theory type **or** Application/Example/Problem)	06 Marks
2	(a)	Attempt Any One out of Two (Theory questions)	06 Marks
	(b)	Attempt any two Out of Three (Theory type **or** Application/Example/Problem)	06 Marks
3	(a)	Attempt any three out of Five (Short or objective type questions)	06 Marks
	(b)	Attempt any Five Out of Eight (Objective / MCQ)	05 Marks

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B.Sc. Programme for semester 3 & 4

(CBCS-Semester-Grading pattern)

Semester end Examination

Format for Question paper Core Compulsory Courses in Physics

w.e.f. June-2021

There will be four questions. All questions are of 18, 17, 18, 17 marks each.

First question will be from Unit - I, Second question will be from Unit-II,

Third question will be from Unit-III, **Forth question will be from all three Units.**

Detailed about all the questions is as under.

Time: 2.5 Hrs **Total Marks: 70**

1	**(a)**	Answer any One out of Two (Long Theory type questions)	07 Marks
	(b)	Answer any Two Out of Three (Short Note/Application/Example/Problem)	10 Marks
2	**(a)**	Answer any One out of Two (Long Theory type questions)	08 Marks
	(b)	Answer any Two Out of Three (Short Note/Application/Example/Problem)	10 Marks
3	**(a)**	Answer any One out of Two (Long Theory type questions)	07 Marks
	(b)	Answer any Two Out of Three (Short Note/Application/Example/Problem)	10 Marks
4	**(a)**	Answer the following (Any Six out of Eight) (Short answer or objective type questions)	12 Marks
	(b)	Answer the following (Any Five out of Seven) (Very Short answer or MCQ type questions)	06 Marks

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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV

(PHYSICS SYLLABUS: Effective from June - 2021)

CC - PHYSICS - 401

UNIT I CLASSICAL MECHANICS

Mechanics of a Single Particle and of System of Particles:

Equation of Motion (3.3), (a) Motion under Constant Force, (b) Motion under a Force which depends on Time only, (d) Case (1) Motion of a particle subjected to a Resistive Force, Case (2) Motion of particle falling under the action of Gravity near the surface of Earth.(3.3) Mechanics of system of particles (3.5), Angular Momentum of the system (3.5 a), Energy of the System(3.5 b), Kinetic Energy of the system(3.5 c), Motion of system with variable mass(3.6) ***Related Examples, Problems, MCQ & Short Questions***

Special Theory Relativity:

Newtonian Relativity(14.1), Michelson-Morley experiment(14.2), Special theory of relativity(14.3), Lorentz Transformation(14.4), Consequences of Lorentz Transformation(14.5) - (a) Relativity of simultaneity (b) Lorentz-fitz Gerald length Contraction (c) Time dilation, Addition of Velocities (14.6), Variation of mass with Velocity(14.7) Mass- energy relation (14.8) ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference:

Introduction to Classical Mechanics by R G Takwale & P S Puranik McGrawHill Education (India) Private Limited

Other References:

1. Concept of Modern Physics by Besier McGraw-Hill
2. Elements of Special Relativity by S.P. Singh & M.k.Bagde S. Chand & Co. New Delhi.
3. Properties of Matter by Brijlal, N.Subrahmanyam, S.chand.
4. Classical Mechanics by Goldstein Narosa Publishing House New Delhi
5. Classical Mechanics by Yashavant Waghmare
6. Classical Mechanics by N C Rana and P S Joag

UNIT II NUCLEAR PHYSICS

Detectors and Accelerators:

Introduction (1.1.1), Interaction between Particles and Matter (A brief survey) (1.1.2), Detectors for Nuclear Particles (1.1.3), **(i)** Proportional counter **(iii)** scintillation counter **(iv)** Solid State or Semiconductor detectors, **Particle Accelerators**(1.1.4),**:** Need for an Accelerator of charged Particles : **(ii)** The Cyclotron, **(iii)** Synchrotron.

Radioactivity: (Review of Radioactive decay laws, half life, mean life time etc.)

Radioactive growth and decay (2.6), Ideal equilibrium (2.7), Transient equilibrium and secular equilibrium (2.8) Radioactive series (2.9) Determination of the age of the Earth (2.12), Carbon Dating-Archaeological Time Scale(2.13)

The Q-Equation:

Introduction (3.1), Types of Nuclear Reaction (3.2), The Balance of Mass and Energy in Nuclear Reaction (3.3), The Q-equation (3.4), solution of the Q-Equation (3.5)

Basic reference:

Nuclear Physics by S. B. Patel (New age International (p) Ltd. Publishers)

Other References:

1. Elements of Nuclear physics by M.L.Pandya & R.P.S. Yadav Kedarnath Rmnath Meerut
2. Nuclear Physics by Kaplan
3. Nuclear Physics by D C tayal, Himalaya Publishing House

UNIT III PLASMA PHYSICS

The Basic concepts of Plasma:

Introduction (1.1), Composition and Characteristics of a Plasma (1.2), Collisions (1.3), Elastic collisions (1.3.1), Inelastic collisions (1.3.2), Surface Phenomena (1.4), Transport Phenomena (1.5), Diffusion and Mobility (1.6) , Viscosity, Conductivity (1.7) , Recombination(1.8), Ohm's law (1.9), Gas Discharge (1.10), Composition of various natural and Man-made Plasma (1.11), Plasma Diagnostics (1.12), Plasma waves and Instabilities Confinement of Plasma (1.13), Space Plasma (1.14). ***Related Examples, Problems, MCQ & Short Questions***

Motion of Charge and velocity in Magnetic and Electric Field

Introduction : Microscopic and Macroscopic approach (2.1), Maxwell's equation Equation of continuity (2.2), (i)Motion of charged particle in electric and magnetic field, (ii) Larmour Radius and Larmour Frequency, (iii) Kinetic Energy (2.3),Uniform magnetic Field and Oscilating electric field(2.4), Magnetic Trap and Double Mirror (2.9.1), Van Allen Radiation Belt(2.9.3) ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference :

Elements of Plasma physics by S.N. Goswami New Central book Agency (p) Ltd., Calcutta.

Other References:

1. Introduction to Plasma Physics and Controlled Fusion Vol-1 F.F.Chen.
2. Plasma physics by S.N.Sen

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV

(PHYSICS SYLLABUS : Effective from June - 2021)

CC - PHYSICS – 402

UNIT I STATISTICAL MECHANICS

Statistical Mechanics : Microscopic & Macroscopic States:

Microscopic states (4.1) Macroscopic States (4.2) Phase Space (4.3) μ-Space (4.4), τ-Space, (4.5),Postulate of equal a priori probability(4.6)

Statistical ensemble :

Micro canonical ensemble (5.1), canonical ensemble(5.2),Alternative method for the derivation of canonical distribution(5.3) Mean Value and Fluctuations(5.4), Grand canonical ensemble(5.5), Alternative derivation of Grand canonical distribution(5.6), Fluctuations in the number of particle of a system in a grand canonical distribution(5.7), Reduction of Gibb's distribution to maxwell's and Boltzman distribution(5.8), Barometric formula (5.9), Experimental verification of the Boltzman distribution(5.10)

Related Examples, Problems, MCQ & Short Questions

Basic Reference :

Fundamentalas of Statistical Mechanics 2nd edition by B B LAUD, New Age International Publishers

Other Reference :

1. Statistical Mechanics and Properties of Matter by E.S.R. Gopal Mc Millan Co. of India Ltd.
2. Statistical Mechanics by B K Agarwal – Melvin Eisner, New Age Inte.Publication

UNIT II MATHEMATICAL PHYSICS AND QUANTAM MECHANICS

Fouries series:

Introduction (7.1), Periodic functions (7.2), Application of Fourier series (7.3), Average values of a function (7.4), Fourier Co-efficient (7.5), Diriclet's condition (7.6), Complex form of Fourier Series(7.7), Other Interval even and odd function(7.8), Parceval Theorem(7.11) ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference:

Mathematical method for physical sciences by M.L.Boss John wiley Publication.

Other References:

1. Mathematical method for Engineer and Physicist by L. A. Pipes Tata Mc-Graw Hill Publication
2. Mathematical Physics by B D Gupta

Schrodinger Equations and Stationary States:

A Free Particle in One Dimension(2.1), Generalization to Three Dimension(2.2), The Operator correspondence and the Schrodinger equation for a particle subject to forces(2.3), Normalization and Probability Interpretation(2.4), Non-Normalizable Wave functions and Box Normalization(2.5). Conservation of Probability(2.6), Expectation values, Ehrenfest's Theorem(2.7), Admissibility Condition on the Wave function(2.8), Stationary States- The time Independent Schrodinger Equation (2.9), Particle in a Square Well Potential, Bound States in a square well (E < 0) ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference: *A Text Book of Quantum Mechanics by Mathews and K.Venkatesan*
Tata Mc-Graw Hill Publication

Other reference:

Quantum Quantum Mechanics by John L. Powell and Bend Crasemann
Quantum Quantum Mechanics by Ghatak and Lokanathan
Quantum Quantum Mechanics by Schiff

UNIT III ELECTRONICS

Digital Electronics:

Introduction (21.1), Number system used in Digital Electronics (21.2), Decimal, Binary, Hexadecimal and Octal (21.2.1 to 21.2.4), Binary Codes-(A) BCD, (B) Gray, (C) Excess-3 Codes (21.4), Universal Gate -NAND Gate, Bubbled OR Gate, Universal Gate-NOR Gate, Bubbled AND Gate, To Prepare NOT, AND and OR Gate Using Univarsal Gate (NAND Gate), Arithmetic Circuits – Exclusive – OR Gate (21.9), Application of X-OR Gate: (i) Binary to Gray Code Converter (ii) A Parity Checker (iii) The Half Adder (iv) The Full Adder (v) Parallel Adder (vi) Half Subtractor, (vii) Full subtractor. ***Related Examples, Problems, MCQ & Short Questions***

Basic Reference:

Hand book of Electronics by Gupta & Kumar 30th Revised Edi., 2002 Pragati Prakashan, Meerut.

Solid state Devices:

JFET (12.1 to 12.6), UJT (26.6, 26.6.1 to 26.6.3), SCR
Related Examples, Problems, MCQ & Short Questions

Basic Reference:

Electronics and Radio Engineering by M.L.Gupta (9th Edition -2002) D Raj & Sons.

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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV

(PHYSICS SYLLABUS : Effective from June - 2021)

Elective Subjective :: PHYSICS : ES - 05
ASTRO / SPACE PHYSICS

UNIT I

Sun and Solar Radiation:

Introduction, Astronomical background, General description of the sun, Solar structure, Sun's outer layers, Composition, Visible features on the sun, More about sun's outer atmosphere, Temperature of the corona, Solar activity and Sunspot cycles.

UNIT-II

Cosmic rays and High energy astrophysics

An introduction to cosmic rays and high energy astrophysics: primary cosmic radiation, energy spectrum of primary cosmic rays, secondary cosmic rays, effect of geomagnetic field on cosmic rays, time variation of cosmic rays, photons in primary cosmic rays, origin of cosmic rays, basic facts about cosmic rays, region of confinement

Basic Reference:

An Introductory Course on Space Science and Earth's Environment by S.S.Degaonker (Gujarat University Publication, Ahmedabad)

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B. Sc. SEMESTER IV

(PHYSICS SYLLABUS : Effective from June - 2021)

Elective Subjective :: PHYSICS : ES – 06
MEDICAL PHYSICS

UNIT I

MedicalImaging Physics

Introduction: What is Medical Physics ? Evolution of Medical Imaging, X-ray diagnostics and imaging, Physics of NMR(Nuclear Magnetic Resonance), NMR Imaging, MRI Radiological Imaging, Ultrasound Imaging, Physics of Doppler with Applications and modes, Vascular Doppler.

Radiography: Filters, Grids, cassette, X-ray film, Film processing, Fluoroscopy, Computed tomography scanner – Principle and Function, display, generations, mammography, Thyroid uptake system and gamma camera (only Principle, function and Display)

UNIT-II

Radiation Oncology Physics: External Beam Therapy (Basic Idea), Telecobalt, Conformal Radiation Therapy (CRT), 3D CRT, IMRT, Image Guided Radiotherapy, EPID, Rapid arc, Proton Therapy, Gamma Knife, Cyber Knife, Contact beam Therapy (Basic Idea), Brachy Therapy-LDR and HDR, Intra Operative Brachy therapy, Radiotherapy, Kilo Voltage Machines, Deep therapy Machine, Telecobalt Machines, Medical Linear accelerator, Basics of Teletherapy units, deep X-ray, Telecobalts units, Radiation Protection, External beam characteristics, dose maximum and build up bolus, percentage depth dose, tissue maximum ratio, and tissue phantom ratio, planned target volume and gross tumour volume.

Reference :

1. Physics of the human Body , by Irving P Herman Springer -2007
2. Medical Physics by J R Cameron and J G Skofronick, Wiley 1978
3. Handbook of Physics in Diagnostic Imaging, by R S Livingstone, B I publication Pvt Ltd
4. The Physics of Radiology by H E johns and Cunningham
5. Physics of Radiation Therapy by F M Khan –Williams and Wilkins,3rd Edition- 2003
6. The Essential Physics of Medical Imaging: Bushburg,Seiberg,Leidholdt and Boone Lippincot, Williams and Wilkins,2nd Edition- 2002

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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV

(PHYSICS PRACTICAL SYLLABUS : Effective from June - 2021)

(PC – PHY - 401)

LABORATORY EXPERIMENT

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1) To determine wavelength of bright lines of Mercury light using Grating.
ગ્રેટીંગની મદદથી મરક્યુરી પ્રકાશની તીવ્ર રેખાની તરંગલંબાઈ મેળવો.

2) To Find out of Resolving Power of Telescope.
ટેલિસ્કોપની વિભેદન શક્તિ શોધવી.

3) Study of X –ray diffraction using Powder pattern.
X –ray વિવર્તન ભાતનો અભ્યાસ પાવડર ભાતની રીત વડે મેળવો.

4) A Study of Decay of Temperature when body is allowed to cool (Theromocouple).
જ્યારે પદાર્થને ઠંડો કરવામાં આવે ત્યારે તાપમાનમાં થતો ક્ષય મેળવો.

5) To study elliptically polarized light using Photocell and quarter wave plate.
ફોટો સેલ અને ક્વાર્ટર વેવ પ્લેટની મદદથી દીર્ઘવૃતીય ધ્રુવીભુત પ્રકાશનો અભ્યાસ કરવો.

6) To find out Activation energy of a Semiconductor.
અર્ધવાહકની સંક્રિયણ ઉર્જા શોધવી .

7) Numerical Analysis (Newton's Forward and Backward Interpolation Formula)
સંખ્યાત્મક પૃથ્થકરણ (આંતર્વેશન)

8) To Find out The Resolving Power of Prism.
પ્રીઝમની વિભેદન શક્તિ શોધવી.

ઉઠો, જાગો અને લક્ષ્યની પ્રાપ્તિ સુધી અવિરત પ્રયત્નશીલ રહો

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER IV

(PHYSICS PRACTICAL SYLLABUS : Effective from June - 2021)

(PC – PHY - 402)

LABORATORY EXPERIMENT

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1) To Determine Current Sensitivity, Voltage Sensitivity, Figure of Merit and R_g of B.G.
   B.G ની પ્રવાહ સંવેદિતા,વોલ્ટેજ સંવેદિતા , ફિગર ઓફ મેરીટ અને R_g મેળવો.

2) To Determine High Resistance by equal Deflection Method.

   સમાન આવર્તનની રીત વડે ગુરુ અવરોધ મેળવો.

3) To Determine Low Value of 'C' using Schering Bridge.
   શેરીંગ બ્રીજની મદદથી લીકિજ કેપેસીટન્સ'c ' મેળવો.

5) Study of Characteristics of a Photodiode and Draw the Graph of $I_D \rightarrow V_D$.
   ફોટોડાયોડની લાક્ષણીકતાઓ મેળવો અનેો$I_D \rightarrow V_D$ નો આલેખ દોરો.

6) Comparision of Capacity (C_1/C_2) by De-Sauty Method.
   ડીસોટીની રીત વડે વીજક્ષમતા(c_1/c_2) ની સરખામણી કરવી.

7) Low Resistance by Method of Projection.
   પ્રક્ષેપનની રીત વડે લઘુ અવરોધ શોધવો .

8) Langrange's Forward Formula and Backward Formula (Interpolation)
   લાગ્રાંજેની ફોરવર્ડ ફોર્મુલા અને બેકવર્ડ ફોર્મુલા (આંતર્વેશન)

9) To find The H-Parameter's from The Transistor in Common Emitter Configuration.
   કોમન એમીટર ટ્રાન્ઝીસ્ટરની લાક્ષણીકતાઓ પરથી એચ-પેરામીટર શોધવા.

સર્વ દિશાઓમાંથી ઉત્તમ અને સુંદર વિચારો પ્રાપ્ત થાઓ

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Biotechnology

Syllabus/ scheme

Sem. – 1

PROGRAM CODE : HNGU1064

Sem./CBCS/Grading pattern

w. e. f. June-2020

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B.Sc. Syllabus for Semester I

SUBJECT: Biotechnology

wef 2020-21

B.Sc. (Biotechnology) Semester-1
➢ **CC- BT-101 Introduction to Biotechnology & Cell Biology**
Elective Course
EC-1 Entrepreneurship Development
EC-2 Biotechnology and Human Welfare
EC-3 Plant Biodiversity

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B.Sc. (Biotechnology) Semester-1

CC- BT-101 Introduction to Biotechnology & Cell Biology

LEARNING OUTCOMES:

- Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
- Students will understand how these cellular components are used to generate and utilize energy in cells
- Students will understand the cellular components underlying mitotic cell division.
- Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

UNIT I **(10 Periods)**

Introduction to biotechnology, definitions, applied area of biotechnology. history of biotechnology. sectors of biotechnology in agriculture, health and environment. Scopes of biotechnology. Biotechnology in India (Scopes and organizations)

UNIT II **(10 Periods)**

Cell: **I**ntroduction and classification of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation. Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport.

UNIT III **(15 Periods)**

Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments. Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion.

UNIT IV **(20 Periods)**

Lysosomes: Vacuoles and micro bodies: Structure and functions Ribosomes: Structures and function including role in protein synthesis. Mitochondria: Structure and function, Genomes, biogenesis. Chloroplasts: Structure and function, genomes, biogenesis Nucleus: Structure and function, chromosomes and their structure.

SUGGESTED READING

Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.

De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

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Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

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PCC-1- PRACTICALS

CC- BT-101 Introduction to Biotechnology & Cell Biology

1. Basic layout of Biotechnology lab
2. Introduction to laboratory instruments
3. Microscopy- Simple & Compound- Basic components & Principle
4. Define various staining- stain types and Principles

a. Simple staining & Negative

b. Gram staining, Capsule staining, Nuclear Mitochondrial staining

5. Study of structure of any Prokaryotic and Eukaryotic cell.
6. Cell division in onion root tip
7. Study, observation and identification of various permanent slides

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Elective (Generic) Course 1 Entrepreneurship Development

LEARNING OUTCOMES:

- Have the ability to discern distinct entrepreneurial traits
- Know the parameters to assess opportunities and constraints for new business ideas
- Understand the systematic process to select and screen a business idea
- design strategies for successful implementation of ideas
- write a business plan

UNIT I **(10 Periods)**

Meaning, Needs and Importance of Entrepreneurship, Promotion of entrepreneurship, Factors influencing entrepreneurship, Features of a successful Entrepreneurship.

Forms of Business Organization, Project Identification, Selection of the product, Project formulation, Assessment of project feasibility.

Importance of finance / loans and repayments, Characteristics of Business finance, Fixed capital management: Sources of fixed capital, working capital its sources and how to move for loans, Inventory direct and indirect raw materials and its management.

UNIT II **(13 Periods)**

Meaning and Importance, Marketing-mix, product management – Product line, Product mix, stages of product like cycle, marketing Research and Importance of survey, Physical Distribution and Stock Management.

Meaning of International business, Selection of a product, Selection of a market for international business, Export financing, Institutional support for exports.

Project Report on a selected product should be prepared and submitted.

SUGGESTED READING

Entrepreneurship: New Venture Creation : David H. Holt

Patterns of Entrepreneurship : Jack M. Kaplan

Entrepreneurship and Small Business Management: C.B. Gupta, S.S. Khanka, Sultan Chand & Sons.

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Elective (Subject) Course 2 Biotechnology and Human Welfare

LEARNING OUTCOMES:

This course is designed to give an idea about the role of biotechnology in relation to Human welfare.

UNIT I **(10 Periods)**

Industry: protein engineering; enzyme and polysaccharide synthesis, activity and secretion, alcohol and antibiotic formation.

Agriculture: N_2 fixation: transfer of pest resistance genes to plants; interaction between plants and microbes; qualitative improvement of livestock.

UNIT II **(15 Periods)**

Environments: e.g. chlorinated and non-chlorinated organic pollutant degradation; degradation of hydrocarbons and agricultural wastes, stress management, development of biodegradable polymers such as PHB.

Forensic science: e.g. solving violent crimes such as murder and rape; solving claims of paternity and theft etc. using various methods of DNA finger printing.

Health: e.g. development of non-toxic therapeutic agents, recombinant live vaccines, gene therapy, diagnostics, monoclonal in *E. coli*, human genome project.

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Elective (Subject) Course 3 Plant Biodiversity

LEARNING OUTCOMES:

This course is designed to give knowledge regarding immense plant biodiversity exist in biological world.

UNIT I

Overview of two kingdom classifications. five kingdom classification. General characters of pteridophytes, affinities with bryophytes & gymnosperms, classification, economic importance.

UNIT II

General characters, classification of gymnosperms and angiosperms, economic importance of seed plants

SUGGESTED READING

1. Bhatnager, S.P. and Moitra, A. 1996 Gymnosperms. New Age International (P) Ltd. Publishers, New Delhi.

2. Parihar, N.S. 1996. The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.

3. Sambamurty 2008 A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. IK International Publishers.

4. Wickens, G.E. 2004 Economic Botany: Principles and Practices, Springer. Kuwer Publishers, Dordrecht, The Netherlands

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NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Chemistry

Syllabus/ scheme

Sem. – 1

Sem./CBCS/Grading pattern

w. e. f. June-2020

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B.Sc. Semester - I

CHEMISTRY SYLLABUS

(Effective From June - 2020)

B.Sc. (Six Semester Programme)

The proposed new courses in chemistry for under graduate classes are reassigned in accordance to semester/CBCS/Grading system with new educational policy. The new course in based on model curriculum of the university grants commission.

The medium of instruction should be Gujarati and/or English and the question paper should be drawn in Gujarati with the English version. Students are permitted to write answers in English or Gujarati language.

Its objectives are as under :

1. To meet the growing demand of specialization and Advanced courses in applied science. ‘
2. To help the colleges to update and modernize their laboratories.
3. To redesign the courses with special emphasis on local requirements, environment and to link the courses, with requirements of the industries and research. . .

This syllabus is to be completed by assigning four periods of one hour each and two practical’s of two hours each per week.

The number of students in practical batch should not exceed Twenty.

PATTERN OF EXAMINATION

There will be one paper for core compulsory and one paper for subject elective theory and Five Hours for practical in the University Examination. The pattern will be as follow.

Written	Examination Time	Marks - External	Marks-Internal
Core Course	2.30 hours	70	30
Sub. Elective Course	2.00 hours	35	15
Fundamental Course	2.00 hours	35	15
Practical Core Course	5 hours	50	- -

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F.Y.B.Sc.

Chemistry.(CC CH 101)

Semester: 1

UNIT: 1 :(A) : CHEMICAL BONDING

- Valence bond theory & its application, Ex. H_2
- Directional characteristics of covalent bond
- Various types of hybridization and shape of simple inorganic molecules Ex. sp – $BeCl_2$, sp^2 – BF_3 , sp^3 – CH_4 , dsp^3 – PCl_5 , d^2sp^3 – SF_6
- V.S.E.P.R. theory for NH_3, H_2O
- M.O. Theory-Energy level diagram for homo nucleus diatomic molecules (N_2 and O_2) and hetero diatomic molecule (CO and NO)

(B) :F – BLOCKELEMENTS

- Lanthanide electronic configuration, Oxidation state
- Lanthanide contraction, Effect of lanthanide contraction
- Separation method
  (1) Solvent extraction methods
  (2) Ion Exchange Method

UNIT: 2 :(A) : STRUCTURE AND PROPERTIES

Factors affecting to the properties of organic molecule

- Intramolecular forces (dipol-dipol interaction, vanderwaals forces)
- Electromeric effect
- Inductive effect
- Resonance effect(draw resonating structures of Nitro benzene, Chlorobenzen, Phenoxide ion, Anillinium ion, Acetate ion)
- Hyper conjugation (o,p-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals)

(B) :REACTION MECHANISM

- Fission of Co-Valent bond (With at least one example of eachintermediates)
- Types of reagents.
- Types of organic reaction with mechanism.
- Substitution reactions (Nucleophillic&Electrophillic)
- Addition reactions (Nucleophillic&Electrophillic)
- Elimination reactions (E_1& E_2)

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UNIT :3 : THERMODYNAMICS

- Thermodynamics (only introduction)
- System and surrounding- work & heat, state function, thermodynamic process, internal energy, enthalpy, free energy, maximum work function.
- First law of thermodynamics
  heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship
- Work done in adiabatic and isothermal reversible expansion of an ideal gas.
- Second law of thermodynamics
- Carnot cycle and its efficiency
- Concept of entropy ; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases
- Gibbs-Helmholtz equation
- Numerical

UNIT : 4 : INTRODUCTION TO VOLUMETRIC ANALYSIS

- **Principle, Mechanism and Applications of,**
- Acid-Base Titrations (Only strong acid Vs strong Base).
- Redox Titrations (Only Fe(II) Vs $KMnO_4$)
- Complexo metric Titrations (Only Ca^{+2}/Mg^{+2}Vs EDTA)
- Precipitation Titrations (OnlyCl^- Vs $AgNO_3$).
- Related Numericals.

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: REFERENCE BOOKS :

INORGANIC CHEMISTRY

1. 'Source Book on Atomic Energy' by glastone, 1969.
2. 'Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.
3. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rdedn, ELPS Oxford University Press, 1999.
4. 'Nuclear and RedioCnemistrv' by G fried lander, J.W.Kcnned. E.S.macias andJ.M.MiIIer, 3rdedn, John wiley, 1981.
5. Essentials of Nuclear Chemistry' H.J.Arnical, 4thedn, New Age International. 1995.
6. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.
7. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.
8. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS, 1991.
9. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

ORGANIC CHEMISTRY

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.
2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.
3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.
4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.
5. Reaction Mechanism and Reagents in Organic Chemistry, Gurdeep R.Chatwal 4thedn, Himalaya Publication House.
6. Text book of Organic Chemistry, ArunBahal, S.Chand.
7. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
8. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.

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PHYSICAL CHEMISTRY

1. Advance Physical Chemistry by Gurdeepraj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli.. S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.
4. Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5thedn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ.Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

ANALYTICAL CHEMISTRY

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5thedn.

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F.Y.B.Sc.

Chemistry (SE CH 101)

Semester: I

SUBJECT ELECTIVE PAPER

(Agriculture Chemistry)

UNIT : 1. : FERTILIZERS

- Plant Nutrients, Major Nutrients, Minor Nutrients, Trace Nutrients
- Definition of Fertilizer
- Classification of Fertilizer
- Synthesis of N Containing Fertilizer i.e. $(NH_4)_2SO_4$, $Ca(CN)_2$, and Urea.
- Synthesis of P Containing Fertilizer i.e. Super Phosphate, Tripal Super Phosphate.
- Mix Fertilizer.

UNIT : 2. : INSECTICIDE

- Introduction
- Inorganic Insecticide
- Organic Insecticide
- Natural or Plant Insecticide
- Synthesis of DDT, BHC, Malathion.

Reference : Industrial Chemistry by B. K. Sharma

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F.Y.B.Sc.
Chemistry Practical
Laboratory Course (LC CH 101)
Semester: I

This syllabus is to be completed by assigning two laboratorysessions per week, each of two hours. Total laboratory work is 60 hrs /semester (4 hrs/week)or 15 weeks.
The number of students in the laboratory batch should notexceed fifteen (15). The medium of instruction should be English in laboratory course.

1. Organic Chemistry

1) Identification of an organic compound through the functional groupanalysis, Determination of melting point and boiling point. Preparation ofsuitable derivative.
2) Candidate should perform the analysis of at least 10 compounds.

List of compounds

- **Acids:**
  Benzoic acid.Cinnainic acid, Phthalic acid.Oxalic acid.Succinic acid.
- **Phenols:**
  α - Napthol. β -Naphthol.
- **Bases:**
  p-Toludine, Diphenylamine. Aniline.Methyl aniline.
- **Neutrals:**
  Naphthalene, Anthracene,Acetamide,Benzamide, Acetanilide, m-Dinitrobenzene, Urea,Thiourea, Toluene. Acetone, Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform. Carbon tetrachloride, Chlorobenzene, Nitrobenzene.

2. Standardization

1) Preparation of standard solution of succinic acid and standardization of NaOH / KOH solution.
2) Preparation of standard solution of $Na_2S_2O_3$ and standardization of I_2 solution.
3) Preparation of standard solution of EDTA and estimation of Ca^{+2} / Mg^{2+}in $CaCl_2$ / $MgCl_2$ solution.
4) Preparation of standard solution of Oxalic acid and standardization of$KMnO_4$ solution.
5) Preparation of standard solution of $K_2Cr_2O_7$ and standardization of$FeSO_4$ solution.

3. Demonstrations

- Preparation of standard stock solution by w / v method and their differentdilutions.
- Preparation of standard stock solution of HCI by v/v method and theirdifferent dilutions.

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NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc.

FOUNDATION COMPULSORY

ENGLISH

Syllabus/ scheme

Semester – 1

Sem./CBCS/Grading pattern

w. e. f. June-2020

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SCHEME OF EXAMINATION

BACHALOR OF SCIENCE PROGRAMME

SEMSTER-I

F C 103

Q.1-(A) One long question with an internal option (from unit –I) (8)

Q.1-(B) Attempt five short questions out of eight (from unit-I) (10)

Q.2- Fill in the blanks with multiple choice. Five blanks from each grammatical topic of unit II. (Ten out of twelve) (10)

Q.3 An unseen paragraph for comprehension with short questions (7)

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B Sc Semester I

Course Level Learning Outcomes:

To encourage students to learn and appreciate language through Short Stories/Essays
To encourage and develop reading habits in Under Graduate Students.
To introduce Under Graduate students to important themes and issues
To enable students to learn basic grammar through the practice of prescribed topics
To encourage students to read and comprehend short passages
To enable students to write short answers

Course Content:

Unit 1

Lesson 1 to 5

Science and Reading - Frank Bros. & Co.

Unit 2

Grammar

Articles,

Primary Auxiliaries (Do, Have, Be) Comprehension

Unit 3

Comprehension of an Unseen Passage

Recommended Reading

High School English Grammar- Wren and Martin
Contemporary English Grammar- David Green

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Faculty of Science

B. Sc. Mathematics

Syllabus/ scheme

Sem. – 1

Sem./CBCS/Grading pattern

w. e. f. June-2020

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Details of B.Sc. Programme Syllabus
CBCS-Semester-Grading pattern: Course Structure

SEMESTER-I

Courses	Courses	Credit/Course	Teaching hrs. Total	Total Credits	Examination			Total Marks
					Internal	External	Hours	
Principle/Core Course: CCMAT-111	1	4	4	4	30	70	2.5	100
Practical/PCMAT-111	1	2	4	2	-	50	-	50
Elective Opt. Disciplinary: ESMAT-11 (Set Theory & Functions)	1	2	2	2	-	50	2	50
Elective Generic	1	2	2	2	-	50	2	50
Foundation Course	1	2	2	2	15	35	2	50

Instructions:

- It is advised to use computer program like Matlab, Excel, GeoGebraetc for the generation of graphical outputs of practical related to drawing of a graphs of the given functions in the course PCMAT-111.

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Details of B.Sc. Programme Syllabus
Under CBCS-Semester-Grading pattern system

Mathematics : Semester-1
Course :CC MAT-111

[In force from June2020]

UNIT 1: Successive Differentiation:

Successive Derivatives, Some standard results for n^{th} derivatives, Leibnitz's Theoremand its examples, Cauchy's Mean Value Theorem, Taylor's Theorem(without proof),Maclaurin's series and its examples.Expansion ofpowerseries ofsinx,cosx,e^x.

UNIT 2: Integration:

Reduction formula : $\int_0^{\pi/2} \sin^n \theta \, d\theta$, $\int_0^{\pi/2} \cos^n \theta \, d\theta$, $\int_0^{\pi/2} \sin^m \theta . \cos^n \theta \, d\theta$, $m, n \in N$

Application of definite integrals to (a) Summation of the series, (b) Rectification(c) Volume.

UNIT 3:Vector analysis and Polar co-ordinates system :

(a) Vector analysis: scalar and vector product of three vectors, product of fourvectors, reciprocal vectors, vector differentiation, gradient, divergent andcurl.

(b) Polar co-ordinates, spherical and cylinder coordinates and their relations.

UNIT 4: Sphere, Cone and Cylinder:

(a) **Sphere:**plane section of sphere, intersection of two spheres, intersection ofsphereand line, power at a point, tangent plane and normal. Plane of contact,angle ofintersection of two spheres, condition of orthogonality.

(b) **Cone:**Definition of cone,vertex,guiding curve, generators, equation of acone witha givenvertex and a guiding curve, right circular cone with givenvertex,axis and semi vertical angle.

(c)**Cylinder:**Definition of a cylinder, equation of a cylinder whosegeneratorsintersect a givencone and are parallel to a given line, equation of a rightcircular cylinder.

Reference Books:

(1) Differential Calculus, by Shantinarayan.
(2) Integral Calculus, by Shantinarayan.
(3) Vector Analysis, by Murry R. Spiegel.
(4) Vector Analysis, by Dr.K.S.Rawat, SARUP &SONS, DELHI
(5) Introduction to Vector Analysis, Fifth Edition, by Herry F. Davis, Arther David Saider.

B.Sc. Programme
CBCS-Semester-Grading pattern
Mathematics : Semester-1
Course :PC MAT-111

Unit1: Practical based on tracing curves (Trigonometric function, Inversefunction, Exponential function, Logarithmic function, Hyperbolic function)

Unit2: Practical based on successive differentiation, Cauchy Mean value theorem, Taylor's& Maclaurin's theorem,

Unit3: Practical based on integral and reduction formula, Summation of the series, Rectification, Volume.

Unit4: Practical based on Sphere, Cone, Cylinder, Application of gradient, divergentand curl.

List of Practicals :

Unit-1 (1)Draw the graph of sin x, cos x, tan x, cot x, secx, cosecx .
(2) Draw the graph of $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$, $\cot^{-1}x$, $\sec^{-1}x$, $\text{cosec}^{-1}x$.
(3) Draw the graph of sinh x, cosh x, tanh x, cothx.
(4) Draw the graph of $\log_a x$& a^x, $a \in R^+ - \{1\}$.
(5) Draw the graph of cardioids, asteroid.

Unit-2 (1)Find the n^{th} derivative of the given function at given point.
(2) Application of Leibnitz theorem.
(3) Application of Cauchy Mean value theorem.
(4) Application of Taylor's theorem.
(5) Application of Maclaurin's theorem.

Unit-3(1)Application of Reduction formula for integration.
(2)Summationof series using integration.
(3) Applicationof rectification by using integration.
(4) Applicationof surface revolution using integration.

Unit-4(1) Application of gradient & divergent.
(2) Application of curl.
(3)Application on Sphere.
(4) Application on Cone.
(5) ApplicationonCylinder.

Course :PC MAT-111

Instructions: Strictly follow the instructions given by examiner.
1. Draw the graphs any two out of three from unit-I (10 Marks)
2. Attempt any two out of three from unit-II (10 Marks)
3. Attempt any two out of three from unit-III (10 Marks)
4. Attempt any two out of three from unit-VI (10 Marks)
5. (a) Viva (5 Marks)
   (b) Journal (5 Marks)

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B.Sc. Programme
CBCS-Semester-Grading pattern
List of Elective (Mathematics Subject) Course
(Credits-2)
Subject Elective Course : ESMAT-11
[Set Theory & Functions]

Unit-1:Set Theory

Sets and subsets, Basic set operations, Sets of numbers, Product sets, Indexed sets, Union and intersection of indexed collections, Principle of duality, Bounded and unbounded sets.

Unit-2:Functions

Definitions, Operators,transformations, Range, one-one Functions, onto functions,Identity function, constant functions, composition of functions (product of functions), Inverseof function, Setfunctions, Real valued functions, algebra of real valued functions,characteristic function.

References :

1. Set Theory & Related Topics.

By. Seymour Lipschutz, McGraw-Hill book Company,Singapur

2. Business Mathematics

By.D.C.Sancheti&V.K.Kapoor, Sultan Chand &Sons Publications, New Delhi.

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Faculty of Science

B. Sc. Microbiology

Syllabus/ scheme

Sem. – 1

Sem./CBCS/Grading pattern

w. e. f. June-2020

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B.Sc. Microbiology (CBCS PATTERN) – Proposed curriculum

(1)

Semester-1

MB-101: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY (THEORY)

TOTAL HOURS: 60 **CREDITS: 4**

Unit 1 History of Development of Microbiology **No. of Hours: 16**

Development of microbiology as a discipline. Spontaneous generation *vs.* biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology, Development of the field of soil microbiology: Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A.Waksman Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner

Unit 2 Diversity of Microorganisms **No. of Hours: 16**

Systems of classification: Binomial nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility General characteristics of different groups: Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Prokarya: Archaea and Bacteria, Eukarya : Algae, Fungi and Protozoa) giving definitions and citing examples Protozoa : Methods of nutrition, locomotion & reproduction - Amoeba, *Paramecium* and *Plasmodium*

Unit 3 Techniques in Microbiology

A. Microscopy **No. of Hours: 10**

Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluoresence Microscope,Transmission Electron Microscope, Scanning Electron Microscope

B. Control of microorganisms **No. of Hours: 10**

Physical *methods of microbial contro l*: Moist Heat, Autoclave, Dry Heat, Hot Air Oven, Tyndallization, Filtration. Radiation
Chemical methods of microbial control: disinfectants, types and mode of action

Unit 4 An overview of Scope of Microbiology **No. of Hours: 8**

SUGGESTED READING

1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition
3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited 4.Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.
4. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
5. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
6. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.

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B.Sc. Microbiology (CBCS PATTERN) – Proposed curriculum

Semester-1

SEMESTER –I (PRACTICALS)

TOTAL HOURS: 60 **CREDITS: 2**

1	Microbiology Good Laboratory Practices and Biosafety.
2	To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the microbiology laboratory.
3	Preparation of culture media for bacterial cultivation.
4	Sterilization of medium using Autoclave and assessment for sterility
5	Sterilization of glassware using Hot Air Oven and assessment for sterility
6	Sterilization of heat sensitive material by membrane filtration and assessment for sterility
7	Demonstration of the presence of microflora in the environment by exposing nutrient agar plates to air.
8	Study of *Rhizopus*, *Penicillium*, *Aspergillus* using temporary mounts
9	Study of *Spirogyra* and *Chlamydomonas*, *Volvox* using temporary Mounts
10	Study of the following protozoans using permanent mounts/photographs: *Amoeba*, *Entamoeba*, *Paramecium* and *Plasmodium*

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B.Sc. Microbiology (CBCS PATTERN) – Proposed curriculum

Semester-1

SUBJECT ELECTIVE

MB-SE-101 : VIROLOGY (THEORY)

TOTAL HOURS: 30 **CREDITS: 2**

Unit 1 Nature and Properties of Viruses **No. of Hours: 13**

Introduction: Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Theories of viral origin Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses Isolation, purification and cultivation of viruses Viral taxonomy: Classification and nomenclature of different groups of viruses

Unit 2

A. Bacteriophages **No. of Hours: 10**

Diversity, classification, one step multiplication curve, lytic and lysogenic phages (lambda phage) concept of early and late proteins, regulation of transcription in lambda phage

B. Applications of Virology **No. of Hours: 7**

General principles of viral vaccination, Use of viral vectors in cloning and expression, Gene therapy and Phage display

SUGGESTED READING

1. Dimmock, NJ, Easton, AL, Leppard, KN (2007). Introduction to Modern Virology. 6th edition, Blackwell Publishing Ltd.
2. Carter J and Saunders V (2007). Virology: Principles and Applications. John Wiley and Sons.
3. Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR, Skalka, AM (2004). Principles of Virology, Molecular biology, Pathogenesis and Control. 2nd edition. ASM press Washington DC.
4. Levy JA, Conrat HF, Owens RA. (2000). Virology. 3rd edition. Prentice Hall publication, New Jersey.
5. Wagner EK, Hewlett MJ. (2004). Basic Virology. 2nd edition. Blackwell Publishing.
6. Mathews. (2004). Plant Virology. Hull R. Academic Press, New York.
7. Nayudu MV. (2008). Plant Viruses. Tata McGraw Hill, India.
8. Bos L. (1999) Plant viruses-A text book of plant virology by. Backhuys Publishers.
9. Versteeg J. (1985). A Color Atlas of Virology. Wolfe Medical Publication.

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NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Geology

Syllabus/ scheme

Sem. – 1

Sem./CBCS/Grading pattern

w. e. f. June-2020

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HEMCHANDRACHARYA NORTH

GUJARAT UNIVERSITY, University Road,

P.O. BOX NO: 21, PATAN-384265.

N. Gujarat,INDIA.

NAAC Accreditation

Grade–"A"

FACULTY OF

SCIENCE

GEOLOGY

SYLLABUS

(Effective from June-2020)

B.Sc. (Semester I Programme)

The proposed new courses in Geology for undergraduate classes are reassigned in accordance to semester / CBCS / Grading system with new education policy. The new course is based on model curriculum of the university grants commission.

The medium of instruction should be Gujarati / English and the question paper should be drawn in Gujarati / English version. Students are permitted to write answer in English or Gujarati language.

Its objectives are as under:

1. To meet the growing demand of Specialization and Advanced Courses in applied science.
2. To help the colleges to update and modernize their laboratories.
3. To redesign the courses the special emphasis on local requirements, environment, to link the courses with requirements of the industries and research.
4. To prepare for National level entrance test like NET / SLET / JRF and other competitive exams.

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FACULTY OF SCIENCE

GEOLOGY

SYLLABUS

(Effective from June-2020)

Common Formula for Question Paper (Core Course)

Time: 2.5 Hours Total Marks: 70

Theory Examination Pattern (Core Course):

Que. No: 1	A: Write any one out of Two Questions.	**09 Marks**
	B: Write any one out of Two Questions.	**09 Marks**
Que. No: 2	A: Write any one out of Two Questions.	**09 Marks**
	B: Write any one out of Two Questions.	**08 Marks**
Que. No: 3	A: Write any one out of Two Questions.	**09 Marks**
	B: Write any one out of Two Questions.	**09 Marks**
Que. No: 4	A: Write any one out of Two Questions.	**07 Marks**
	Write Ten Short questions / M.C.Q / Short numerical / diagram (Three Questions to be asked from each Unit).	**10 Marks**

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NAAC Accreditation

Grade–"A"

FACULTY OF

SCIENCE

GEOLOGY

SYLLABUS

(Effective from June-2020)

Common Formula for Question Paper (Elective Course)

Time: 2 Hours

Total Marks: 35

TheoryExaminationPattern (Elective Course):

Que. No: 1	A: Write any two out of Three Questions. (Each of 06 marks)	**12 Marks**
Que. No: 2	A: Write any two out of Three Questions. (Each of 06 marks)	**12 Marks**
Que. No: 3	Write any Eleven out of Twelve Short question / M.C.Q / Short numerical / diagram (Three Questions to be asked from each Unit).	**11 Marks**

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GEOLOGY

PRACTICAL

(Effective from June-2020)
GEO 101 PR-1

Common Formula for Question Paper (Practical Course)

Time: 05 Hour **Total Marks: 50**

Practical Examination Pattern:

1. Identify the Megascopic Minerals. Give physical properties of it and give name of the Minerals.
2. Identify the Megascopic Minerals. Give physical properties of it and give name of the Minerals.
3. Determine the specific gravity of minerals by using walker steel Yard and Jolly's spring Balance.
4. Viva-voce.
5. Journal Work.

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Design and Structure of Geology (Earth Sciences) UG Courses for Choice Based Credit System to be implemented from June 2020

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN						
B. Sc. Three year (General) Programme with 144 credits Semester-I and II in **GEOLOGY** from June-2020						
General pattern/scheme of study components along with credits						
Study Components		**Instru. Hrs/ Week**	**Examination**			**Credits**
			Internal Marks	**UNi. Exam. Marks**	**Total Marks**	
Semester – I						
	Core Compulsory (CC) Course					
GEO 101	General and Physical Geology, Mineralogy	4	30	70	100	4
CC-II-1	Core Course	4	30	70	100	4
CC-III-1	Core Course	4	30	70	100	4
	Practical core (PC) Course					
GEO 101 PR-1	Mineralogy Lab.	4		50	50	2
PC-II-1	Practical Core Course	4		50	50	2
PC-III-1	Practical Core Course	4		50	50	2
	Foundation Course (FC)					
FG	Compulsory English (L.L.)	2	15	35	50	2
	Elective Course (EC)					
EG	Elective (Generic) Course	2	15	35	50	2
GEO (CSE)	Elective (Geology) Course- Historical Geology	2	15	35	50	2
		30	**135**	**465**	**600**	**24**

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F. Y. B.Sc.

Semester I

GEOLOGY - THEORY and PRACTICALS

Course-wise detail syllabus

GEO 101: General and Physical Geology, Mineralogy

Unit	Course details
Unit –1	EARTH AS A PLANET: General principles of geology as a science. Branches & scope of subject. Earth as a member of solar system – shape, size, mass and density of the earth – its movements. Origin of the earth – review of the different theories. Origin of the universe and evolution of the solar system.
Unit –2	EARTH'S INTERNAL STRUCTURE: Earth's internal structure, constitution, composition and formation. Brief introduction to Radioactivity and age of the Earth. Introduction to Convection in the earth's interior and earth's magnetic field. Elementary ideas of continental drift and plate tectonics.
Unit - 3	PHYSICAL GEOLOGY: Weathering, erosion, denudation, transportation and deposition. Introduction to Geological agents – Glaciers, Rivers, Lakes, Winds.
Unit – 4	MINERALOGY: Chemical bonding and compound formation. Definition, Classifications and Physical properties of minerals.

Reference Books:

1) Introduction to Physical Geology, A. K. Datta, Kalyani Publisher, New Delhi.
2) A Text Book of Geology, P. K. Mukerjee, World press.
3) A Text Book of Geology with Special Reference to India, G. B. Mahapatra.
4) General Geology, V. Radhakrishnan (1987), V.V.P. Publishers, Tuticorin.
5) Geomorphology, Enayat Ahmed, Kalyani Publisher, New Delhi.
6) Principles of Geomorphology, W. D.Thornbury (1969), John Willey Inc.
7) Principles Physical Geology, Arthur Holmes (1978), ELBS.
8) Engineering and General Geology, Parbin Singh (1994), S.K. Kataria and Sons, Delhi.
9) Rutley's Elements of Mineralogy, H. H. Read, CBS publishers.
10) Introduction to Rock Forming Minerals, R. A. Deer, R. E. Howie and J. Zussman (1978), The English Language Book Society.

GEO 102 (CSE): Historical Geology

Unit	Course details	Credits
Unit–1	Historical geology-Concept, Earth's Age, Understanding of origin and evolution of life.	**1**
Unit–2	Concepts of geological time and Geologic Time Scale. Major events of mass extinction.	**1**

GEO 101 PR-1: Mineralogy Lab.

Course details
Study of the physical properties of the minerals – Megascopic identification of the following common rock forming minerals: Quartz, amethyst, chalcedony, agate, jasper, orthoclase, microcline, plagioclase, muscovite, biotite, garnet, hornblende, augite, tourmaline, olivine, chlorite. Ores – magnetite, hematite, chromite, pyrolusite, pyrite, galena, sphalerite, bauxite. Determination of specific gravity of minerals – by Walker Steel Yard Balance and Jolly's spring Balance.

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NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Physics

Syllabus/ scheme

Sem. – 1

Sem./CBCS/Grading pattern

w. e. f. June-2020

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PROGRAMME SPECIFIC OUTCOMES TO BE ATTAINED AT THE END OF THE PROGRAMME

The Board of Studies in Physics recognizes that curriculum, course content and assessment of scholastic achievements play important roles in shaping education. The committee is of the view that assessment should support and encourage the broad instructional goals such as basic knowledge of the discipline of Physics including phenomenology, theories and techniques, concepts and general principles. This should also support the ability to ask subjective questions and to obtain its solutions by use of qualitative and quantitative reasoning and by experimental investigation. With this in mind, we aim to provide a firm foundation in every aspect of Physics ranging from a broad spectrum of modern trends in Physics to experimental, computational and mathematical skills of students. Hence, the UG (B.Sc.) syllabi has been framed in such a way that it bridges the gap between the plus two and PG (M.Sc.) levels of Physics by providing a more comprehensive and logical framework in almost all areas of basic Physics.

Aims of the the programme:

- To make students eligible for Higher Studies and professional courses.
- To develop the skills required to gather information from resources and use them.
- To develop the abilities to read, understand and interpret physical information – verbal, mathematical and graphical.
- To provide an intellectually stimulating environment to develop skills and enthusiasms of students to the best of their potential.
- To give need based education in physics of the highest quality at the undergraduate level.
- To offer courses to the choice of the students.
- To enable students to perform experiments and interpret the results of observation, including an assessment of experimental uncertainties.
- To make students eligible for government job.

Objectives:

By the end of the first year (2nd semester), the students should have attained a common level in basic of physics to complement the core for their future courses and developed their experimental and data analysis skills through experiments at laboratories.

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LEARNING OUTCOME :

SEMESTER	COURSE	UNIT	UNIT TITLE	OUTCOMES
SEMESTER - 1	CC-PHY-101	1	Vector Algebra and Vector analysis:	Recall the principles and basic equations and apply them to solve problems. Understand the concepts and significance of Scalar and Vector Fields. Learns operations with operator ∇. Learns about Gauss's Divergence Theorem, Stoke's Theorem and Derivation of Green's Theorem.
		2	Simple Harmonic Oscillations	Understand the concepts of Simple Harmonic Oscillations and combination. Understand the concepts of Damped Oscillations and Forced Oscillations and its applications.
		3	D.C. Circuits, Network Theorem & AC Bridges:	Learns and recalls the basic concepts of Circuits and its functioning. Learns Network theorems and recalls the basic concepts and principles of Network analysis. Apply theorems to construct and solve electrical circuits
		4	Rectifier and filter circuits:	Learns and recalls the basic principles and working of various rectifier and filter circuits. Learns about Zener diode, its characteristics and applications.
	ES-PHY-01		Instrumentation Measurement and analysis	This course is to get exposure with various aspects of instruments and their usage. Learns about basics of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements. Learns about the construction, working and use of various measuring instrument.

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Hemchandracharya North Gujarat University, Patan

B.Sc. Programme (CBCS-Semester-Grading pattern)

Semester End Examination

Format for Question paper : Elective Courses (Subject) in Physics

BSc : SEM I & II

Time: 2Hrs **Total Marks: 35**

W.E.F. June – 2020

Structure of the Paper in Examination

There will be two questions each of 12 marks. Third question will be of 11 marks.
First question will be from Unit – I.
Second question will be from Unit – II.
Third question will be from Unit – I. and Unit-II.
All the questions are detailed as under.

1 (a)	Attempt any one out of two. (Theory questions)	06 Marks
(b)	Attempt any two out of three. (Application/Example/Problem)	06 Marks
2 (a)	Attempt any one out of two. (Theory questions)	06 Marks
(b)	Attempt any two out of three. (Application/Example/Problem)	06 Marks
3 (a)	Attempt any three out of five. (Short question)	06 Marks
(b)	Attempt any five out of eight. (objective/ MCQ)	05 Marks
	TOTAL 35 MARKS	

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B.Sc. Programme (CBCS-Semester-Grading pattern)

Semester End Examination

Format for Question paper Core Compulsory Courses in Physics

(B.Sc. Sem - I & II)

(W.E.F. JUNE - 2020)

The university examination paper consists of four questions.
First question is of 18 marks and will be from Unit – I.
Second question is of 17 marks and will be from Unit – II.
Third question is of 18 marks and will be from Unit – III.
Forth question is of 17 marks and will be from Unit – IV.
All the questions are detailed as under.

Time: 2.5 Hrs **Total Marks: 70**

1 (a) Attempt any two out of three. (Theory questions)	12 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three or anyone out of two. (Short question)	02 Marks
2 (a) Attempt any two out of three. (Theory questions)	12 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	03 Marks
(c) Attempt any two out of three or anyone out of two. (Short question)	02 Marks
3 (a) Attempt any two out of three. (Theory questions)	12 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three or anyone out of two. (Short question)	02 Marks
4 (a) Attempt any two out of three. (Theory questions)	12 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	03 Marks
(c) Attempt any two out of three or anyone out of two. (Short question)	02 Marks

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B.Sc. Programme (CBCS-Semester-Grading pattern)

Semester End Examination

Format for Question paper Core Compulsory Courses in Physics

(B.Sc. Sem - I & II)

(W.E.F. JUNE - 2019)

The university examination paper consists of four questions.

First question is of 18 marks and will be from Unit – I.

Second question is of 17 marks and will be from Unit – II.

Third question is of 18 marks and will be from Unit – III.

Forth question is of 17 marks and will be from Unit – IV.

All the questions are detailed as under.

Time: 2.5 Hrs **Total Marks: 70**

1 (a) Attempt any one out of two. (Theory questions)	07 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three. (Short answer)	04 Marks
(d) Attempt any three out of four. (MCQ)	03 Marks
2 (a) Attempt any one out of two. (Theory questions)	06 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three. (Short answer)	04 Marks
(d) Attempt any three out of four. (MCQ)	03 Marks
3 (a) Attempt any one out of two. (Theory questions)	07 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three. (Short answer)	04 Marks
(d) Attempt any three out of four. (MCQ)	03 Marks
4 (a) Attempt any one out of two. (Theory questions)	06 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three. (Short answer)	04 Marks
(d) Attempt any three out of four. (MCQ)	03 Marks

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Three Year Programme with 144 credits

Pattern to be implemented from June- 2020

General Pattern/Scheme of study components along with credits for Science faculty.

Part/ Class	Course code	Study Components	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
First Year B.Sc.		**Semester-I**					
		Core Compulsory (CC) Course					
	CC-I-1	Core Course-I (Paper-1)	4	30	70	100	4
	CC-II-1	Core Course-II (Paper-1)	4	30	70	100	4
	CC-III-1	Core Course-III (Paper-1)	4	30	70	100	4
		Practical Core (PC) Course					
	PC-I-1	Practical Core Course-I (Paper-1)	4		50	50	2
	PC-II-1	Practical Core Course-II (Paper-1)	4		50	50	2
	PC-III-1	Practical Core Course-III (Paper-1)	4		50	50	2
		Foundation Course (FC)					
	FC-1	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EC-1	Elective (**Generic**) Course –I	2	15	35	50	2
	EC-2	Elective (**Subject**) Course –I	2	15	35	50	2
			30	**135**	**465**	**600**	**24**
First Year B.Sc.		**Semester-II**					
		Core Compulsory (CC)Course					
	CC-I-2	Core Course-I (Paper-1)	4	30	70	100	4
	CC-II-2	Core Course-II (Paper-1)	4	30	70	100	4
	CC-III-2	Core Course-III (Paper-1)	4	30	70	100	4
		Practical Core (PC) Course					
	PC-I-2	Practical Core Course-I (Paper-1)	4		50	50	2
	PC-II-2	Practical Core Course-II (Paper-1)	4		50	50	2
	PC-III-2	Practical Core Course-III (Paper-1)	4		50	50	2
		Foundation Course (FC)					
	FC-2	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EC-3	Elective (**Generic**) Course -II	2	15	35	50	2
	EC-4	Elective (**Subject**) Course –II	2	15	35	50	2
			30	**135**	**465**	**600**	**24**

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: PHYSICS :: SEMESTER-I
CC PHY-101
(In force from June 2020)

Unit -1

Vector Algebra & Vector Analysis

- Dyadic (1.10) Scalar Triple product (1.11) Reciprocal vectors (1.12) vector. Triple product (1.13) Pseudo vectors and Pseudo Scalars.(1.16)
- Differentiation of a vector with respect to time (2.2) Integration of vector , Line Integral (2.3 a) , Surface Integral (2.3 b) Partial differentiation (2.4) , Gradient of a scalar point function (2.5), Divergence of vector (2.6), The equation of continuity (2.7) Curl of a vector (2.8) , More about the vector differential operator ∇ (2.9) , Multiple Del operations (2.11) Irrotational AND Solenoidal vectors (2.12) Some useful identities (2.13), Gauss' Theorem (2.14) , Green's theorem (2.15) , Stokes Theorem (2.17) Physical Significance of the Curl of a vector.
- Related Examples & Problem.
- **Basic Reference**
- Introduction to Classical Mechanics by R.G. Takwale & P.S. Puranik Tata McGraw-Hill Publishing Company Ltd.
- **Other Reference**
- Electricity and Magnetism By K.K.Tewari
- Mathematical method in physical sciences by M.L. Boas (john Willey & Sons)

Unit – 2

Simple Harmonic Oscillations,

- Composition of two simple Harmonic Motions along the same direction of the same frequency (2.8) , Two simple Harmonic Motions act upon a particle simultaneously having no phase difference but they differ in frequency by very small amount (2.9) Composition of two simple Harmonic Motions acting upon a particle simultaneously at right angles to each other, same time period but different in phase (2.10) lissajous figure (2.11) , Experimental determination of lissajous figures : (2.12 a and 2.12 b) Related Examples & Problem
  Motion Due to a constant force (3.2), The Force acts for short time and to find its effect (3.3 A particle executing S.H.M. is acted upon by a harmonic force $FsinpT$ of frequency $\frac{p}{2\pi}$) (3.4), Motion in a resisting medium (3.5), Forced Vibration(3.6 a),Amplitude Resonance: Maximum Displacement of the system (3.7) , Maximum energy of the system : Velocity Resonance (3.8), Phase of the forced vibration(3.9), Power supply at steady state of forced vibration (3.10)
  Related Examples & Problem
- Compound Pendulum & Oscillations Bar pendulum – (Element of Properties of matter by D.S Mathur)

Basic Reference :-

A Text Book On Oscillations , Wave and Acoustics by M. Ghosh & D. Bhattacharya (S. Chand & Company LTD.) (for Simple Harmonic Oscillations)

Other Reference :-

1. Waves and oscillations By N. Subhramanyam & Brij lal (Vikas Publishing House Pvt. Ltd, New Delhi)

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2. Introduction to Classical Mechanics by R.G. Takwale & P.S. Puranik (for Damped & Forced Oscillations)

Unit -3

D.C Circuit , Network Theorem & AC Bridges

D.C Circuit

- Simple R-L Circuit – Growth and decay of current Helmholtz equitation (11.24) , R-c Circuit (11.25),Measurement of high resistance by method of leakage (11.26), Comparison of capacities by De Sauty's Method (11.27), Ideal L-C. Circuit (11.28) , Series LCR Circuit (Change case only) (11.29).
- Related Examples & Problem

Network Theorem

- Superposition Theorem (18.5), Thevenin's Theorem (18.6), Norton's Theorem (18.7), Maximum Power Theorem (18.8)
- Related Examples & Problem

AC Bridges.

- AC Bridges (17.5) AC Bridges for the measurement of inductances (17.6)
  (1) Maxwell Bridge (2) Anderson Bridge ,
- A.C Bridge for the measurement of capacitance (17.7)
  (1) De Sauty's A.C Bridge (2) Schering Bridge,
  Related Examples & Problem

Basic Reference :-

Electricity and magnetism by K.K. Tewari (S. Chand & Company Ltd)

Other Reference :-

1. Electrical Circuit Analysis by Sony and Gupta
2. Network Analysis by G.K. Mittal. (Khanna Publications)
3. Electricity and Magnetism by D. C. Tayal

Unit- 4

Rectifier and Filter Circuits

- The Half Wave Rectifier (2.2) , Voltage Regulation (2.3), Ripple Factor (2.4) , Ratio of Rectification (2.5), Transformer utilization factor (2.6) , Disadvantage of Half Wave Rectifier (2.7), The Full Wave rectifier (2.8), The Bridge Rectifier (2.9), Comparison of Rectifiers Circuit (2.11),
- The Inductor Filter (3.1), Experimental Determination of Ripple Factor (3.2),The Capacitor Filter (3.3), Ripple Factor (Approximate method) (3.4), Ripple Factor (Accurate method), (3.5), Effect of capacitor Series Resistance (3.7), The Choke input Filter (3.9), Ripple factor in LC filter (3.10), Value Of critical inductance (3.11), the CLC filter (3.13), Comparison of filter circuits (3.14),
- Zener diode and its characteristics (6.1) , The Voltage regulator circuit (6.3), Effect of Temperature on Zener diode (6.7)
- Related Examples & Problem

Basic Reference

Electronic Device & Circuits by Allen Mottershead , (PHI Pvt. LTD)

Other Reference

1. Electronics and Radio Engineering by M.L.Gupta.
2. Basic Electronis and Linear circuits by Bhargva Kulshreshth & Gupta TMH Edition
3. Elements of Electronics by Bagde & Singh.
4. Hand book of Electronics by Gupta and Kumar

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: PHYSICS :: SEMESTER-I
Elective (Subject) Courses
ES PHY-01
Instrumentation Measurement and analysis
(In force from June 2020)

UNIT-I:
Vernier Calipers: Introduction, Theory, Figure, Description of the instrument, Detail study of Least count, Errors, Positive error, negative error, Determination of magnitude of positive and negative errors.
Micrometer Screw: Introduction, Theory, Figure, Description of the instrument, Definition of pitch and its determination, study of least count, Meaning of the error and explanation of positive and negative errors. Determination of positive and negative errors. Method of taking observation with the help of Micrometer Screw.
Spherometer : Introduction, Theory, Figure, Description of the instrument, To determine the pitch of the screw, To determine the least count of the spherometer, Zero error, Derivation of the formula for the radius of curvature of a curved surface.

UNIT-II
Wheatstone Bridge: Introduction, Theory with figure, The figure of meter bridge used in laboratory, construction of Meter bridge.
Post-Office box: Introduction, Theory, Circuit Diagram, Theoretical Circuit diagram, explanation of working with necessary formula.
Construction of Galvanometer: Introduction, Theory, Sensitivity and Figure of Merit of Galvanometer.
Spectrometer: Introduction, Construction and explanation of three main parts of Spectrometer, Mercury Discharge lamp, Sodium Discharge lamp, The adjustment, leveling and the method of recording the observation of Spectrometer.
Book for Study: Experimental Book for Physics.

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CBCS - Semester - Grading Pattern
B. Sc. :: PHYSICS :: SEMESTER-I
PC PHY-101
(In force from June 2020)

LABORATORY EXPERIMENTS

1. Damping coefficient, Relaxation and quality factor in the damped motion a simple Pendulum.
2. Study of Resonator: Verification of relation $n^2 (V + k\nu) =$ constant and determine the frequency of unknown fork.
3. Determination of Moment of inertia of a Fly wheel.
4. Verification of Stefan Boltzman's fourth power law using A.C. /D.C. Source.
5. Determination of the capacitance 'c' of a condenser.
6. Study of the series resonance with frequency variation.
7. P-N Junction diode as Half Wave Rectifier (i) Without filter (ii) With Series Inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of regulation.
8. V-I characteristics of Zener diode and its use as Voltage regulator.
9. Verification of Thevenin's theorem.
10. Arrangement of Spectrometer for parallel rays using Schuster method, Calibration of the spectrometer and determines the wavelength of unknown line of Hg-spectrum.
11. Refractive index of liquid using convex lens.
12. Analysis of error.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

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Faculty of Science

B. Sc. STATISTICS

Syllabus/ scheme

Semester – 1

Sem./CBCS/Grading pattern

w. e. f. June-2020

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B.SC. SEM-I

Programme Name	Bachelor of Science
Semester	First
Paper No.	CC-STAT-101
Course name	Descriptive Statistics – I
Course Type	Core
Effective From	June – 2020

Unit No.	Content	Marks	Credit
1	**Data Types and Classification** Types of data: Primary, Secondary, Internal and External data and their sources. Designing a questionnaire schedule. Classification of data: Qualitative, Quantitative: Discrete, Continuous; Chronological (Time series) data. Nominal, Ordinal, Interval and Ratio data. Frequency: grouped and ungrouped data; Construction of frequency and cumulativefrequency distribution. Presentation of qualitative data: Tabulation (up to four attributes).	25%	1
2	**Representation of Data** Graphical representation of grouped data: Histogram, frequency curve, frequency polygon, ogives (cumulative frequency curves), Diagrammatic representation of data: Bar diagrams- simple Bar, multiple bar,sub-divided bar and percentage bar diagrams.Two dimensional diagrams: Rectangles and Pie diagrams.	25%	1
3.	**Measures of Central Tendency** Concept of central tendency, various measures of central tendency and their inter relationship. Their merits and demerits. Empirical relation between mean, median and mode. Properties and applications of measures of central tendency. Partition values.	25%	1
4.	**Measures of Dispersion and Moments** Concept of variation/dispersion, Absolute and relative measures of dispersion with their merits, demerits and applications. Moments: raw moments, central moments, factorial moments and their interrelationship. Skewness, Kurtosis and their measures. Stem - Leaf plot and box plot.	25%	1

Reference Books for Paper STA-101:

1. Statistical analysis: Graphs and diagrams, S. M. Nair and M. Garg, Spectrum books (P) Ltd, New Delhi.
2. Introduction to the Practice of Statistics, Moore, S. David; McCabe, P. George W. H. Freeman and Company, New York.
3. Basic Statistics, Agarwal, B. L., New Age International (P) Ltd.
4. Introduction to the theory of Statistics, Mood, A. M., Greybill, F.A., Boes, D.C., McGraw Hill.
5. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand and Sons, New Delhi.

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B.SC. SEM-I

Programme Name	Bachelor of Science
Semester	First
Paper No.	PC-STAT-101
Course name	Descriptive Statistics – I (Practical)
Course Type	Core
Effective From	June – 2020

Unit No.	Content	Marks	Credit
1.	**Manual** 1. Classification of the variable/data into various category and tabulation. 2. Construction of frequency table (one way and two way). 3. Data visualization: Histogram, frequency curve, frequency polygon, ogives (cumulative frequency curves), Bar Diagrams, Pie Diagram, Stem - Leaf and box plot. 4. Problems based on measures of central tendency. **5.** Problems based on measures of dispersion.	50%	1
2.	**Computer** 1. Classification of the variable/data in to various category and tabulation. 2. Construction of frequency table (one way and two way). 3. Data visualization: Histogram, Frequency curve, frequency polygon, ogives (cumulative frequency curves), Bar Diagrams, Pie Diagram, Stem - Leaf and box plot. 4. Problems based on measures of central tendency. **5.** Problems based on measures of dispersion.	50%	1

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B.SC. SEM-I

Programme Name	Bachelor of Science
Semester	First
Paper No.	ES-STAT-11
Course name	Quantitative Techniques
Course Type	Elective Opt.
Effective From	June – 2020

Unit No.	Content	Marks	Credit
1.	**Decision Theory :** Introduction - Components of Decision - Making – Decision Rules (Maxi-max, Mini-max, Laplace, Horwitch), Decision under uncertainty, Pay of matrix, EMV method, Concepts of EVPI and EPPI.	50%	1
2.	**Replacement Problem :** Introduction - Replacement policy for equipment which detoriate gradually (when value of money remains constant) – Replacement of items when fails suddenly – Group replacement – Staff Replacement – Simple Illustrations.	50%	1

References :

1. Quantitative Techniques by P.C. Tulsian, Pearson Education
2. Quantitative Techniques by N. D. Vohra, McGraw Hil

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Zoology

Syllabus/ scheme

Sem. – 1

Sem./CBCS/Grading pattern

w. e. f. June-2020

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The proposed new structure for B. Sc. course is based on Choice Based Credit System (CBCS) which is in force June-2020.

CBSC Course Pattern

1. This programme is divided into **Six Semesters** (Three Years). The duration of an academic year consists of two semester, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. Each semester has 24 credits and the programme is comprised of total 144 credits.
2. There will be five categories of courses/papers in this programme: CC- Core Course, PC- Practical Core, EG- Elective Generic, ES- Elective Subject and FC- Foundation Compulsory.
3. The theory courses with 4 credits shall have 60 hrs of direct classroom teaching workload (15 weeks × 4). The theory courses with 3 credits shall have 45 hrs of teaching workload (15 weeks × 3) and the theory courses with 2 credits shall have 30 hrs of teaching workload (15 weeks × 2).

Attendance: The attendance rules will be as per the rules and regulation of Hemchandracharya North Gujarat University, Patan.

Medium of Instruction: The medium of instruction shall be Gujarati but students are free to write answers in Gujarati or English in examination.

Language of question paper: Question paper should be drawn in Gujarati and English translation of the questions must be given in the question paper.

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Structure of question paper

1. For four credit course: each syllabus is of 4 units having equal weightage.
2. For two credit course: each syllabus is of 2 units having equal weightage.
3. For question paper of 70 marks (4 credits): each question paper shall have 6 questions:

	Total marks	
Q. 1	14	Must be drawn from Unit 1 and will have one long question of 14 marks OR two short questions of 7 marks each
Q. 2	14	Must be drawn from Unit 2 and will have one long question of 14 marks OR two short questions of 7 marks each
Q. 3	07	10 short questions must be drawn from Unit 1 & 2, out of which student has to answer any 7.
Q. 4	14	Must be drawn from Unit 3 and will have one long question of 14 marks OR two short questions of 7 marks each
Q. 5	14	Must be drawn from Unit 4 and will have one long question of 14 marks OR two short questions of 7 marks each
Q. 6	07	10 short questions must be drawn from Unit 3 & 4 out of which student has to answer any 7.
Total	**70**	

4. For question paper of 35 marks (2 credits): each question paper shall have 3 questions:

	Total marks	
Q. 1	15	Must be drawn from Unit 1 and will have one long question of 15 marks OR three short questions of 5 marks each.
Q. 2	15	Must be drawn from Unit 2 and will have one long question of 15 marks OR three short questions of 5 marks each.
Q. 3	5	7 short questions must be drawn from Unit 1 & 2, out of which student has to answer any 5.
Total	**35**	

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B. Sc. Semester I

Course	Course code	Paper title	Exam duration (Hours)	External marks	Internal marks	Total marks	Teaching hours per week	Credit points
Paper-I	ZL-CC-101	Non-chordates I: Protista to Pseudocoelomates	2.30	70	30	100	4	4
Paper-II	CC-2	Core Course -2	2.30	70	30	100	4	4
Paper-III	CC-3	Core Course -3	2.30	70	30	100	4	4
Practical Paper-I	ZL-PC-101	Practical (Non-chordates I: Protista to Pseudocoelomates)	More than 4 hours	50	00	50	4	2
Practical Paper-II	PC-2	Practical Core Course -2	More than 4 hours	50	00	50	4	2
Practical Paper-II	PC-3	Practical Core Course -3	More than 4 hours	50	00	50	4	2
Foundation compulsory.	FC	Compulsory English	2.00	35	15	50	2	2
Generic elective	EG	Generic elective	2.00	35	15	50	2	2
Elective subject Course	ZL-ES-101 **OR** ZL-ES-102	Wetland Ecology **OR** Human Disease and Control	2.00 2.00	35 35	15 15	50 50	2 2	2 2
Total				**465**	**135**	**600**	**30**	**24**

ZL-CC-101 NON-CHORDATES I: PROTISTA TO PSEUDOCOELOMATES

Unit 1 **15 hrs**

1. Grades of body organization: level of organization, body symmetry, formation of germ layers, formation of coelom, body segmentation.
2. General characteristics and classification of protozoa (up to class)
3. Type study: Paramecium (habit and habitat, body structure, locomotion, nutrition, respiration, excretion and reproduction)
4. Life cycle of *Plasmodium*

Unit 2 **15 hrs**

1. General characteristics and classification of phylum porifera (up to class)
2. Canal system and types of spicules in sponges
3. General characteristics and classification of phylum cnidaria (up to class)
4. Type study: *Hydra* (habit and habitat, external and internal structure, digestive system, respiration, excretion, nervous system, reproduction and regeneration)

Unit 3 **15 hrs**

1. General characteristics and classification of phylum platyhelminths (up to class)
2. Type study: *Fasciola* (habit and habitat, structure, digestive system, respiration, excretion, nervous system, reproduction)
3. General characteristics and classification of phylum nematoda (up to class)
4. Type study: *Ascaris* (habit and habitat, structure, digestive system, respiration, excretion, nervous system, reproduction)

Unit 4 **15 hrs**

1. Protozoan related diseases: infestation, symptoms and treatment (Amoebiasis, Giardiasis, Malaria)
2. Coral and coral reefs
3. Classification and adaptations of parasites
4. Platyhelimithes and nematod related diseases: infestation, symptoms and treatment (Cysticercosis, Ascariasis, Filariasis)

References

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition.
2. Pechnik J. A. (2015) Biology of the Invertebrates, McGraw Hill Higher Education. 555 pp. 7th edition.
3. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.
4. EkambaranathaAyyar, M. and T.N. Ananthakrishnan, (1992) Manual of Zoology Vol. 1 (Invertebrata), parts I and II.S. Viswanathan (Printers and Publishers) Pvt. Ltd; Madras. 2.

ZL-ES-101 WETLAND ECOLOGY

Unit 1 **15 hrs**

1. History and classification of wetlands
2. Types of wetlands; Tidal marshes, mangroves and freshwater marshes
3. Human impact and management of wetlands
4. Wetlands laws and protection

Unit 2 **15 hrs**

1. Important wetlands of the world
2. Important wetlands of India
3. Important wetlands of Gujarat
4. Threats to the wetland habitat

References

1. Mitsch W. J. and Gosselink J. G. (2015) Wetlands, Wiley publications, 747 pp.
2. Chatrath K. S. J. (1997) Wetlands of India South Asia Books.
3. Kamboj R. D. and Tatu K. (2017) Important wetland destinations of Gujarat-A guide for ecotourist to explore some wetland jewels in Gujarat, GEER foundation, Gandhinagar.

ZL-ES-102 HUMAN DISEASE AND CONTROL

Unit 1 **15 hrs**

1. Types of diseases: communicable and non communicable disease
2. Disease vector and their mode of transmission
3. Important disease vectors
4. Epidemic diseases

Unit 2 **15 hrs**

1. Human diseases caused by bacteria and their preventions
2. Human diseases caused by protozoan and their preventions
3. Human diseases caused by parasites and their preventions
4. Human genetical disorders

References

1. Temparo C. D. and Lewis M. A. (2000) Diseases of the Human Body: Third Edition F.A. Davis Company, 450 pp
2. Cheng T.C. (1964) The Biology of animal parasites, Saunders International Student Edition
3. Panikar C.K.J (1988) 5. The Parasitology of Trematodes Oliver and Boyd Ltd. Edinburgh.
4. Sood Pamnik (1993) Parasitology (Protozoology and Helminthology) CBS Publication and Distrubution, Delhi

ZL-PC-101 NON-CHORDATES I: PROTISTA TO PSEUDOCOELOMATES

List of practical

1. Study of classification of protozoans (up to class) using laboratory specimens, models, slides, charts.
2. Study of classification of phylum porifera (up to class) using laboratory specimens, models, slides, charts.
3. Study of classification of phylum cnidaria (up to class) using laboratory specimens, models, slides, charts.
4. Study of classification of phylum platyhelminthes (up to class) using laboratory specimens, models, slides, charts.
5. Study of classification of phylum nemetoda (up to class) using laboratory specimens, models, slides, charts.
6. Study of external morphology of *Paramecium* and preparation of whole mount slide of *Paramecium* from culture.
7. Examination of pond water collected from different places for diversity in protista
8. Study of adult *Fasciola hepatica*, *Taenia solium, Ascaris lumbricoides* and its life stages (Slides/micro-photographs)
9. Study of different body systems of *Hydra, Fasciola* and *Ascaris* using models, slides and charts.
10. Study of human parasitic diseases related to protozoan, platyhelmithes and nematode.
11. Field trip and report preparation

PRACTICAL EXAM SKELETON

B. Sc. Semester I (Zoology)

Practical: ZL-PC-101 Non-chordates I: Protista to Pseudocoelomates

Time: 5 hours Total marks: **50**

Date:

1. Examine the sample of pond water under microscope and show different protists to examiner……...**07**

OR

Prepare slide of paramecium from given culture and show it to examiner ……....**07**

2. Draw, label the diagram of given system of particular animal and describe location and functions of different organs in brief.……...……**07**
3. Do as directed……..**21**
    1. Identify and classify the specimen up to class and describe its morphological characters.
    2. Identify and classify the specimen up to class and describe its morphological characters.
    3. Identify and classify the specimen up to class and describe its morphological characters.
    4. Identify and classify the specimen up to class and describe its morphological characters.
    5. Identify and classify the specimen up to class and describe its morphological characters.
    6. Identify and describe life stage of given specimen
    7. Identify the specimen describe details of disease caused to human by it.

4. Viva voce……**05**
5. Journal……..**05**
6. Field trip report submission……**05**

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NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Biotechnology

Syllabus/ scheme

Sem. – 2

PROGRAM CODE : HNGU1064

Sem./CBCS/Grading pattern

w. e. f. June-2020

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B.Sc. Syllabus for Semester II

SUBJECT: Biotechnology

wef 2020-21

➢ **CC- BT-201 Biochemistry**
Elective Course
EC-1 Bioethics and Biosafety
EC-2 Developmental Biology
EC-3 Animal Biodiversity

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B.Sc. (Biotechnology) Semester-2

CC- BT-201 Biochemistry

LEARNING OUTCOMES:

- The structure and function of specialized proteins and enzymes
- The relationship between the structure and function of specific biological molecules
- How enzymes are regulated
- The main principles of metabolic biochemistry concepts
- How homeostasis is controlled in the body
- The function of specific anabolic and catabolic pathways and how these pathways are controlled and interrelated

UNIT I: **(10 Periods)**

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions

UNIT II **(10 Periods)**

Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.

UNIT III **(10 Periods)**

Protein: Primary and Secondary structure of protein, tertiary and quaternary structure of protein, biological functions. structure of myglobin and hemoglobin.

UNIT IV **(10 Periods)**

Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines,. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA

SUGGESTED READING

Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.

Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.

Nelson, D.L., Cox, M.M. (2004) Lehninger Principles of Biochemistry, 4th Edition, WH Freeman and Company, New York, USA.

Hopkins, W.G. and Huner, P.A. (2008) Introduction to Plant Physiology. John Wiley and Sons.

Salisbury, F.B. and Ross, C.W. (1991) Plant Physiology, Wadsworth Publishing Co. Ltd.

PCC-1-I PRACTICALS
CC- BT-201 Biochemistry

1. Preparation of Standard solution
2. Preparation of buffer solution and use of pH meter
3. Qualitative tests for Carbohydrates
4. Qualitative tests for Amino acids
5. Estimation of reducing sugar
6. Estimation of Non-reducing Sugar
7. Quantitative estimation of Proteins
8. Quantitative estimation of Nucleic

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Elective (Generic) Course-1 Bioethics and Biosafety

LEARNING OUTCOMES:

This course is designed to give knowledge on IPR & Bioethics.

UNIT-I **(15 Periods)**

Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions. Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations. Entrepreneurship: Selection of a product, line, design and development processes, economics on material and energy requirement, stock the product and release the same for making etc. The basic regulations of excise: Demand for a given product, feasibility of its production under given constraints of raw material, energy input, financial situations export potential etc.

UNIT II **(10 Periods)**

Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International. Ethical issues against the molecular technologies.

Biosafety– Introduction to biosafety and health hazards concerning biotechnology. Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

SUGGESTED READING

Sateesh MK (2010) Bioethics and Biosafety, I. K. International Pvt Ltd.

Sree Krishna V (2007) Bioethics and Biosafety in Biotechnology, New age international publishers

Elective (Subject) Course-2 DEVELOPMENTAL BIOLOGY

LEARNING OUTCOMES:
This course is designed to give understanding of various molecular aspects of developmental biology to bachelor students.

UNIT I **(10 Periods)**

Definition, scope & historical perspective of development Biology, Gametogenesis – Spermatogenesis, Oogenesis Fertilization - Definition, mechanism, types of fertilization. Different types of eggs on the basis of yolk.

Cleavage: Definition, types, patterns & mechanism Blastulation: Process, types & mechanism Gastrulation: Morphogenetic movements– epiboly, emboly, extension, invagination, convergence, de-lamination. Formation & differentiation of primary germ layers, Fate Maps in early embryos.

UNIT II **(20 Periods)**

Differentiation: Cell commitment and determination- the epigenetic landscape: a model of determination and differentiation, control of differentiation at the level of genome, transcription and post-translation level Concept of embryonic induction: Primary, secondary & tertiary embryonic induction, Neural induction and induction of vertebrate lens.

Neurulation, notogenesis, development of vertebrate eye. Fate of different primary germlayers Development

SUGGESTED READING

Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.

Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer Press.

Kalthoff, (2000). Analysis of Biological Development, II Edition, McGraw-Hill Professional.

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Elective (Subject) Course-3 Animal Biodiversity

UNIT I

Outline of classification, General features and important characters consider for classification. introduction to phylum of invertebrates

UNIT II

chordates general characters and classification Urochordata or Tunicata, Cephalochordata and Vertebrata. Cyclostomata Chondrichthyes class reptilia and amphibian, avis and mammal

SUGGESTED READING

1. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

2. Kardong, K.V. (2005) Vertebrates Comparative Anatomy, Function and evolution. IV Edition. McGraw-Hill Higher Education.

3. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-HillCompanies.

4. Weichert, C.K. (1970). Anatomy of Chordate. McGraw Hill.

5. Young, J.Z. (2004). The life of vertebrates. III Edition. Oxford university press.

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NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Chemistry

Syllabus/ scheme

Sem. – 2

Sem./CBCS/Grading pattern

w. e. f. June-2020

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B.Sc. Semester - II

CHEMISTRY SYLLABUS

(Effective From June - 2020)

B.Sc. (Six Semester Programme)

The proposed new courses in chemistry for under graduate classes are reassigned in accordance to semester/CBCS/Grading system with new educational policy. The new course in based on model curriculum of the university grants commission.

The medium of instruction should be Gujarati and/or English and the question paper should be drawn in Gujarati with the English version. Students are permitted to write answers in English or Gujarati language.

Its objectives are as under :

1. To meet the growing demand of specialization and Advanced courses in applied science. ‘
2. To help the colleges to update and modernize their laboratories.
3. To redesign the courses with special emphasis on local requirements, environment and to link the courses, with requirements of the industries and research. . .

This syllabus is to be completed by assigning four periods of one hour each and two practical’s of two hours each per week.

The number of students in practical batch should not exceed Twenty.

PATTERN OF EXAMINATION

There will be one paper for core compulsory and one paper for subject elective theory and Five Hours for practical in the University Examination. The pattern will be as follow.

Written	Examination Time	Marks - External	Marks-Internal
Core Course	2.30 hours	70	30
Sub. Elective Course	2.00 hours	35	15
Fundamental Course	2.00 hours	35	15
Practical Core Course	5 hours	50	- -

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F.Y.B.Sc.

Chemistry. (CC CH 201)

Semester: II

UNIT:1 :(A) : COORDINATION COMPOUNDS

- Definition
- Nomenclature of Complex.
- Werner's theory and its experimental verification.
- Concept of Effective Atomic Numbers (E.A.N.) for Coordination Compounds.
- Limitations of Valence bond theory of transition metal Complexes.
- An Elementary idea of(C.F.T.) Crystal field splitting of d-orbital in Oh and Td.
- Factors affecting to the crystal field splitting.
- Application of common complexes & chelates.

(B) :ACTINIDE.

- Electronic Configuration.
- Oxidation state.
- Synthesis of $^{239}_{94}Pu$, $^{241}_{94}Pu$.

UNIT: 2 :STEREO CHEMISTRY OF ORGANIC COMPOUNDS

Introduction of Stereo Isomers;

- Optical isomerism :
  General, Discussion of elements of symmetry, Molecular chirality, Enantiomers, Optical activity, Properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, Diastereomers, Threo andErythrodiastereomers, Meso compounds.
- Geometrical isomerism:
  Definition and general discussion of geometric isomers, General methods of structure determination (physical methods), E-Z nomenclature (Simple illustration should be given).
- Conformational isomerism:
  Definition, Conformational analysis of ethane, n-butane with rotational andtortional diagram, Conformation of cyclohexane, Axial and equitorial bonds, Newmann projection, Show horse formula, Fisher & flying wedge formula. Difference between conformation andconfiguration.

Unit: 3:CHEMICAL KINETICS.

- Introduction of following terms.
- Rate of reaction, Order of reaction, Molecularity.
- Rate equation for second order reaction. (a=b) & (a≠b).
- Characteristics of second order reaction.
- Rate equation for third order reaction(a = b = c)
- Characteristics of third order reaction.
- Concective reaction.
- Parallel reaction.
- Reversible reaction
- Numerical.

Unit :4: ANALYTICAL CHEMISTRY

- Introduction to Analytical Chemistry
- Classification of Classical and Electroanalytical Techniques.
- Literature of Analytical Chemistry(Names of Author and Publishers for Any Ten Books, Journals and Reviews)
- Criterion for Selection of analytical Techniques.
- Analytical Data Treatment
  - Error, Types of errors, Accuracy and Precission.
  - Statistical Terms :

    Mode, Average, Median, Deviation,

    Average Deviation, Relative Average Deviation,

    Standard Deviation & Coefficient of variance.
  - Q-Test for the rejection of result and related numericals.
  - Significant figures.
  - 2.5 d and 4.0 d rules.

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: REFERENCE BOOKS :

INORGANIC CHEMISTRY

1. 'Source Book on Atomic Energy' by glastone, 1969.
2. 'Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.
3. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rdedn, ELPS Oxford University Press, 1999.
4. 'Nuclear and RedioCnemistrv' by G fried lander, J.W.Kcnned. E.S.macias andJ.M.MiIIer, 3rdedn, John wiley, 1981.
5. Essentials of Nuclear Chemistry' H.J.Arnical, 4thedn, New Age International. 1995.
6. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.
7. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.
8. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS, 1991.
9. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

ORGANIC CHEMISTRY

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.
2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.
3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.
4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.
5. Reaction Mechanism and Reagents in Organic Chemistry, Gurdeep R.Chatwal 4thedn, Himalaya Publication House.
6. Text book of Organic Chemistry, ArunBahal, S.Chand.
7. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
8. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.

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PHYSICAL CHEMISTRY

1. Advance Physical Chemistry by Gurdeepraj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli.. S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.
4. Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5thedn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ.Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

ANALYTICAL CHEMISTRY

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5thedn.

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F.Y.B.Sc.

Chemistry (SE CH 201)

Semester: II

SUBJECT ELECTIVE PAPER

(Medicinal Chemistry)

UNIT: 1 : INTRODUCTION

- Introduction of drugs.
- History of medicinal chemistry.
- Classification of drugs.
- General importance of drugs.
- Drug Design.

UNIT: 2 :ANTI-MALARIAL DRUGS

- Introduction and History.
- Life cycle of Plasmodium
- Natural anti-malarial drugs :
  Role ofactivity side in quinine structure
- Classification ofanti-malarial drugs.
- Synthesis of Quinoline derivatives :
  8-Amino quinoline derivatives.
  (Plasmoquine&Pamaquine)

Reference:

1. SanshieshitAuoshadho nu Rasavan by Dr. Anamik Shah.
2. SanshleshitAuoshadho nu Rasavun by Dr. J.P.Trivedi&Dr. K.A.Thakar
3. Chemistry of Synthetic Drugs by Dyson & May.

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F.Y.B.Sc. Semester: II

Chemistry Practical (Laboratory Course) CH LC-201

This syllabus is to be completed by assigning two laboratory sessions per week. Each of two hours. Total laboratory work is 60 hrs /sem (4 hrs /week) or 15 weeks.

The number of students in the laboratory batch should not exceed fifteen (15).

The medium of instruction should he English in laboratory course.

1. Inorganic Chemistry

Semi micro Analysis:

- Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B.
- Anion analysis like $Cl^-, Br^-, I^-, NO_3^-, NO_2^-, SO_4^{-2}, SO_3^{-2}, S^{-2}, CrO_4^{-2}, CO_3^{-2}, PO_4^{-3}$ (Water Soluble and insoluble).
- Candidate should perform the analysis of at least 10 compounds.

2. Volumetric Titrations

1) To determine the strength of NaOH and Na_2CO_3 present in the solution mixture of NaOH& Na_2CO_3 and to find out their percentage composition.
2) To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the solution mixture of $NaHCO_3$& Na_2CO_3 and to find out their percentage composition.
3) To determine the Normality, gram/liter and molarities of $H_2C_2O_4\ 2H_2O$ and H_2SO_4 present in the solution mixture of $H_2C_2O_4\ 2H_2O$& H_2SO_4 by using X N NaOH and Y N $KMnO_4$ solutions.
4) To determine the Normality, gram/liter and molarity of $H_2C_2O_4\ 2H_2O$ and $K_2C_2O_4$ present in the solution mixture of $H_2C_2O_4\ 2H_2O$& $K_2C_2O_4$ by using X N NaOH and Y N $KMnO_4$ solutions.
5) To determine the amount of Ca^{+2} and Mg^{+2} ion by EDTA solution from the mixture solution of $CaCl_2$ and $MgCl_2$.

3. Demonstrations

- Melting point and Boiling point of an organic compound.
- Calibration of burette and Pipette..

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NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc.

FOUNDATION COMPULSORY

ENGLISH

Syllabus/ scheme

Semester – 2

Sem./CBCS/Grading pattern

w. e. f. June-2020

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SCHEME OF EXAMINATION

BACHALOR OF SCIENCE PROGRAMME

SEMSTER-II

F C 203

Q.1-(A) One long question with an internal option (from unit –I) (8)

Q.1-(B) Attempt five short questions out of eight (from unit-I) (10)

Q.2- Fill in the blanks with multiple choice. Five blanks from each grammatical topic of unit II. (Ten out of twelve) (10)

Q.3 Paragraph Writing (7)

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B Sc Semester II

Course Level Learning Outcomes:

To encourage students to learn and appreciate language through Short Stories/Essays
To encourage and develop reading habits in Under Graduate Students.
To introduce Under Graduate students to important themes and issues
To enable students to learn basic grammar through the practice of prescribed topics
To enable students to compose short paragraphs and develop writing skills

Course Content:

Unit 1
Lesson 6 to 10
Science and Reading Frank Bros. & Co.
Unit 2
Grammar
Prepositions,
Conjunctions
Unit 3
Composition:
Paragraph Writing

Recommended Reading
High School English Grammar- Wren and Martin
Contemporary English Grammar- David Green

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PATAN- 384265

Faculty of Science

B. Sc. Mathematics

Syllabus/ scheme

Sem. – 2

Sem./CBCS/Grading pattern

w. e. f. June-2020

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Details of B.Sc. Programme Syllabus
CBCS-Semester-Grading pattern: Course Structure

SEMESTER-II

Courses	Courses	Credit/Course	Teaching hrs. Total	Total Credits	Examination			Total Marks
					Internal	External	Hours	
Principle/Core Course: CCMAT-122	1	4	4	4	30	70	2.5	100
Practical/PCMAT-122	1	2	4	2	-	50	-	50
Elective Opt. Disciplinary: ESMAT-12 (Business Mathematics -1)	1	2	2	2	-	50	2	50
Elective Generic	1	2	2	2	-	50	2	50
Foundation Course	1	2	2	2	15	35	2	50

Instructions:

- For the course PCMAT-122 [unit-iv]: It is advised use of MATLAB programming to perform the practical.

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B.Sc. Programme
CBCS-Semester-Grading pattern
Mathematics : Semester-2
Course :CC MAT-122
[In force from June 2020]

Unit1: De'Morve's theorem and its applications, (a) Roots of a complex Number(b) Application of Expansion of $\sin^n\theta, \cos^n\theta, n \in \mathbb{N}$ in terms of sineand cosine ofmultiples ofθ. (C)Expansion of $\sin n\theta$, $\cos n\theta$and $\tan n\theta$interms of sine, cosine and tangent respectively.

Unit2: (a) Exponential, Circular and hyperbolic function, Logarithmic andinversefunctions. (b) Sequence and series: Definition of sequence and series, Convergence of sequence and series, partial sum, comparisontest, ratio test, root testand its examples.

Unit3:Differential Equations:

(a) Linear differential equation $\frac{dy}{dx} + Py = Q$, P and Q are functions of x,

(b) Bernoulli's differential equation.

(c) Linear differential equation with constant coefficients.

Unit4:Matrices:

Introduction of Matrices,Hermitian and Skew-Hermitianmatrices, lineardependence and independence of row and column matrices, Row rank, Column rank and rank of matrix, Row- reduced Echelon form of a matrix andmatrix inversion using it.

Reference Books:

(1) Complex Variables and Appiication, by Ruel V. Churchill & James Ward Brown,McGraw-Hill Publishing Company, New Delhi.

(2) Complex Analysis, by J.V.DESHPANDE, Tata McGRAW-Hill Publishing Co.Ltd. New Delhi.

(3) Theory of Matrices, by B.S.Vatssa, 2nd Edition, Wiley Easterns Ltd.

(4) Matrix Operations, by Schaum's Series McGRAW-HILL Book Co.

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B.Sc. Programme
CBCS-Semester-Grading pattern
Mathematics : Semester-2
Course : PC MAT-122
[In force from June 2020]

List of Practicals:

Unit 1 :(1) Application ofDe'Morve's theorem.
(2) Application of roots of complex number.
(3) Application of $\sin^n\theta$ and $\cos^n\theta$in terms of series of sine and cosine respectively.
(4) Application of $\sin n\theta$and $\cos n\theta$in terms of series of sine and cosine.
(5) Application of $\tan n\theta$in terms of series of tangent.

Unit 2:(1) Application of Exponential, Circular and hyperbolic function
(2) Application of inverse hyperbolic function and logarithm functionof acomplex number.
(3) Application of comparison test for a given sequence.
(4)Application of root test for a given sequence.
(5) Application of ratio test for a given sequence.

Unit3:(1) Application of linear differential equation $\frac{dy}{dx} + Py = Q$, where Pand Qare function of x.
(2) Application ofBernoulli's differential equation.
(3) Application of linear differential equation with constant-coefficients.

Unit 4:(1)Solution of simultaneous linear equations using matrices.
(2)Application of the inverse matrix by row reduction method.
(3)Application of the rank of a matrix.
(4)Application of the rank of a matrix by transforming into echelonform.
(5) Application ofHermitian and skew-Hermitian matrices.

B.Sc. Programme
CBCS-Semester-Grading pattern
Mathematics : Semester-2
Course : PC MAT-122
[In force from June 2020

Instructions: Strictly follow the instructions given by examiner.
1. Attempt any two out of three from unit-I (10 Marks)
2. Attempt any two out of three from unit-II (10 Marks)
3. Attempt any two out of three from unit-III (10 Marks)
4. Attempt any two out of three from unit-VI (10 Marks)
5. (a) Viva (5 Marks)
   (b) Journal (5 Marks)

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B.Sc. Programme
CBCS-Semester-Grading pattern
List of Elective (Mathematics Subject) Course
(Credits-2)
Subject Elective Course : ESMAT-12
[Business Mathematics-1]

Unit 1:[Logic]

Logical Statements, Truth table, Negation, Compound statements, Tautologies and Contradiction, Negation of Compound statements, Propositions, Conditional and Biconditional statements.

Unit 2: [Permutations and Combinations]

Fundamental rules of counting, Definition ofPermutations and Permutation of n different things, Permutation of repeated things, Circular Permutation, Definition of Combination standard results and examples.

Referance books:

(1) Business Mathematics, by. D.C.Sancheti&V.K.Kapoor, Sultan Chad & Sonspublication, NewDelhi.
(2) Business Mathematics, by. B.S.ShahPrakashsan, Ahmedabad.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Microbiology

Syllabus/ scheme

Sem. – 2

Sem./CBCS/Grading pattern

w. e. f. June-2020

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B.Sc. Microbiology (CBCS PATTERN) – Proposed curriculum

Semester-2

MB-201 : INTRODUCTION TO BACTERIOLOGY (THEORY)

TOTAL HOURS: 60 **CREDITS: 4**

Unit 1 Cell organization **No. of Hours: 20**

Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pili.Cell-wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaebacterial cell wall, Gram and acid fast staining mechanisms, lipopolysaccharide (LPS),sphaeroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall.Cell Membrane: Structure, function and chemical composition of bacterial and archaeal cellmembranes.Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmidsEndospore: Structure, formation, stages of sporulation.

Unit 2 Bacteriological techniques **No. of Hours: 15**

Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and accessing non-culturable bacteria.

Unit 3 Growth and nutrition **No. of Hours: 15**

Nutritional requirements in bacteria and nutritional categories;Culture media: components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media

Unit 4 Reproduction in Bacteria **No. of Hours: 10**

Asexual methods of reproduction, logarithmic representation of bacterial populations, phases of growth, calculation of generation time and specific growth rate

SUGGESTED READINGS

1. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
2. Black JG. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall
3. Madigan MT, and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
4. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology. 5th edition Tata McGraw Hill.
5. Srivastava S and Srivastava PS. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht
6. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.
7. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education.
8. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
9. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited

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B.Sc. Microbiology (CBCS PATTERN) – Proposed curriculum

Semester-2

SEMESTER –2 (PRACTICALS)

TOTAL HOURS: 60 **CREDITS: 2**

1. Preparation of different media: synthetic media BG-11, Complex media-Nutrient agar, McConkey agar, EMB agar.
2. Simple staining
3. Negative staining
4. Gram's staining
5. Acid fast staining-permanent slide only.
6. Capsule staining
7. Endospore staining.
8. Isolation of pure cultures of bacteria by streaking method.
9. Preservation of bacterial cultures by various techniques.
10. Estimation of CFU count by spread plate method/pour plate method.
11. Motility by hanging drop method.

B.Sc. Microbiology (CBCS PATTERN) – Proposed curriculum

Semester-2

SUBJECT ELECTIVE

MB-SE-201 : MICROBIOLOGICAL ANALYSIS OF AIR AND WATER (THEORY)

TOTAL HOURS: 30 **CREDITS: 2**

Unit 1

A. Aeromicrobiology **No of Hours: 4**

Bioaerosols, Air borne microorganisms (bacteria, Viruses, fungi) and their impact on human health and environment, significance in food and pharma industries and operation theatres, allergens

B. Air Sample Collection and Analysis **No of Hours: 7**

Bioaerosol sampling, air samplers, methods of analysis, CFU, culture media for bacteria and fungi, Identification characteristics

C. Control Measures **No of Hours: 4**

Fate of bioaerosols, inactivation mechanisms – UV light, HEPA filters, desiccation, Incineration

Unit 2

A. Water Microbiology **No of Hours: 4**

Water borne pathogens, water borne diseases

B. Microbiological Analysis of Water **No of Hours: 7**

Sample Collection, Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive/MPN tests, confirmed and completed tests for faecal coliforms (b) Membrane filter technique and (c) Presence/absence tests

C. Control Measures **No of Hours: 4**

Precipitation, chemical disinfection, filtration, high temperature, UV light

Suggested Reading

1. da Silva N, Taniwaki MH, Junqueira VC, Silveira N, Nascimento MS, Gomes RAR (2012) Microbiological Examination Methods of Food and WaterA Laboratory Manual, CRC Press
2. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
4. Hurst CJ, Crawford RL, Garland JL, Lipson DA (2007) Manual of Environmental Microbiology, 3rd edition, ASM press

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Geology

Syllabus/ scheme

Sem. – 2

Sem./CBCS/Grading pattern

w. e. f. June-2020

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HEMCHANDRACHARYA NORTH

GUJARAT UNIVERSITY, University Road,

P.O. BOX NO: 21, PATAN-384265.

N. Gujarat,INDIA.

NAAC Accreditation

Grade–"A"

FACULTY OF

SCIENCE

GEOLOGY

SYLLABUS

(Effective from June-2020)

B.Sc. (Semester II Programme)

The proposed new courses in Geology for undergraduate classes are reassigned in accordance to semester / CBCS / Grading system with new education policy. The new course is based on model curriculum of the university grants commission.

The medium of instruction should be Gujarati / English and the question paper should be drawn in Gujarati / English version. Students are permitted to write answer in English or Gujarati language.

Its objectives are as under:

1. To meet the growing demand of Specialization and Advanced Courses in applied science.
2. To help the colleges to update and modernize their laboratories.
3. To redesign the courses the special emphasis on local requirements, environment, to link the courses with requirements of the industries and research.
4. To prepare for National level entrance test like NET / SLET / JRF and other competitive exams.

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FACULTY OF

SCIENCE

GEOLOGY

SYLLABUS

(Effective from June-2020)

Common Formula for Question Paper (Core Course)

Time: 2.5 Hours Total Marks: 70

Theory Examination Pattern (Core Course):

Que. No: 1	A: Write any one out of Two Questions.	**09 Marks**
	B: Write any one out of Two Questions.	**09 Marks**
Que. No: 2	A: Write any one out of Two Questions.	**09 Marks**
	B: Write any one out of Two Questions.	**08 Marks**
Que. No: 3	A: Write any one out of Two Questions.	**09 Marks**
	B: Write any one out of Two Questions.	**09 Marks**
Que. No: 4	A: Write any one out of Two Questions.	**07 Marks**
	Write Ten Short questions / M.C.Q / Short numerical / diagram (Three Questions to be asked from each Unit).	**10 Marks**

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Grade–"A"

FACULTY OF

SCIENCE

GEOLOGY

SYLLABUS

(Effective from June-2020)

Common Formula for Question Paper (Elective Course)

Time: 2 Hours

Total Marks: 35

TheoryExaminationPattern (Elective Course):

Que. No: 1	A: Write any two out of Three Questions. (Each of 06 marks)	**12 Marks**
Que. No: 2	A: Write any two out of Three Questions. (Each of 06 marks)	**12 Marks**
Que. No: 3	Write any Eleven out of Twelve Short question / M.C.Q / Short numerical / diagram (Three Questions to be asked from each Unit).	**11 Marks**

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GEOLOGY

PRACTICAL

(Effective from June-2020)
GEO 201 PR-1

Common Formula for Question Paper (Practical Course)

Time: 05 Hour **Total Marks: 50**

Practical Examination Pattern:

1. Identify the given Megascopic Rock sample. Give the texture, Mineral constituents and Conclusion of it. Also give the name of the Rock.

2. Identify the Microscopic Mineral section. Write a microscopic properties of it. Give the name of minerals and draw a section of over the polarizer and between the crossed nicols.

3. Identify the given Crystal model and Write the Axial ratio, System, Symmetry, Class, Type, Combination forms and Mineral name.

4. Viva-voce.

5. Journal Work.

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Design and Structure of Geology (Earth Sciences) UG Courses for Choice Based Credit System to be implemented from June 2020

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN						
B. Sc. Three year (General) Programme with 144 credits Semester-I and II in **GEOLOGY** from June-2020						
General pattern/scheme of study components along with credits						
Study Components		**Instru. Hrs/ Week**	**Examination**			**Credits**
			Internal Marks	**UNi. Exam. Marks**	**Total Marks**	
Semester – II						
	Core Compulsory (CC) Course					
GEO 201	Physical Geology, Mineralogy and Petrology	4	30	70	100	4
CC-II-2	Core Course	4	30	70	100	4
CC-III-2	Core Course	4	30	70	100	4
	Practical core (PC) Course					
GEO 201 PR-1	Optical Mineralogy, Crystallography and Petrology Lab.	4		50	50	2
PC-II-2	Practical Core Course	4		50	50	2
PC-III-2	Practical Core Course	4		50	50	2
	Foundation Course (FC)					
FG	Compulsory English (L.L.)	2	15	35	50	2
	Elective Course (EC)					
EG	Elective (Generic) Course	2	15	35	50	2
GEO (CSE)	Elective (Geology) Course- Basics of geomorphology	2	15	35	50	2
		30	**135**	**465**	**600**	**24**

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F. Y. B.Sc.

Semester II

GEOLOGY - THEORY and PRACTICALS

Course-wise detail syllabus

GEO 201: Physical Geology, Mineralogy and Petrology

Unit	Course details
Unit –1	DYNAMICS OF THE EARTH: Volcanoes – types, causes, effects, products and distribution. Earthquakes – causes, classification, intensity, effects, seismic belts, seismograph and seismogram, prediction. Mountains – causes, types, distribution.
Unit –2	OPTICAL MINERALOGY: Nature of light, Phenomenon of polarisation, Reflection, Refraction, Double refraction, Properties of isotropism, anisotropism. Construction of Nicol prism, Petrological microscope and its parts. Passage of light through Nicol prism.
Unit - 3	CRYSTALLOGRAPHY: Definition, Characteristics, Laws of Crystallography, Interfacial angle, Elements of symmetry, Parameters system of Weiss and Miller Indices. Classifications of crystals.
Unit - 4	PETROLOGY: Magma: Definition, composition, origin; Definition and classification of rocks **Igneous rocks:** Origin, classification, common textures, composition and uses. **Sedimentary rocks:** Origin, classification, consolidation, diagenesis, fabric and textures, composition and uses. **Metamorphic rocks:** Agents, origin, classification, textures, composition and uses.

Reference Books:

1) Elements of Optical Mineralogy, N. H. Winchel, A. N. Winchel (1968), Willey,
2) The Principles of Petrology, G. W. Tyrell (1960), Asia Publishing House.
3) Petrology, W. T. Haung (1962), Mc. Graw Hill.
4) Dana's Text Book of Mineralogy, Revised by W.E. Ford, Wiley Eastern Ltd., New Delhi.

GEO 202 (CSE): BASICS OF GEOMORPHOLOGY

Unit	Course details	Credits
Unit–1	Geomorphology- Basic geological process and its effects on landscape.	**1**
Unit–2	Major depositional and erosional landforms associated with coasts, rivers and deserts..	**1**

GEO 201 PR-1: Optical Mineralogy, Crystallography and Petrology Lab.

Course details
Identification of the following minerals in thin sections – Quartz, orthoclase, microcline, plagioclase, muscovite, biotite.
Classification of crystals in to six types. Study of Elements of Symmetry of Eleven (11) types of symmetry.
Megascopic identification of typical rocks: Granite, Syenite, Gabbro, Rhyolite, Basalt, Conglomerate, Sandstone, Shale, Limestone, Quartzite, Marble.

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NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Physics

Syllabus/ scheme

Sem. – 2

Sem./CBCS/Grading pattern

w. e. f. June-2020

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PROGRAMME SPECIFIC OUTCOMES TO BE ATTAINED AT THE END OF THE PROGRAMME

The Board of Studies in Physics recognizes that curriculum, course content and assessment of scholastic achievements play important roles in shaping education. The committee is of the view that assessment should support and encourage the broad instructional goals such as basic knowledge of the discipline of Physics including phenomenology, theories and techniques, concepts and general principles. This should also support the ability to ask subjective questions and to obtain its solutions by use of qualitative and quantitative reasoning and by experimental investigation. With this in mind, we aim to provide a firm foundation in every aspect of Physics ranging from a broad spectrum of modern trends in Physics to experimental, computational and mathematical skills of students. Hence, the UG (B.Sc.) syllabi has been framed in such a way that it bridges the gap between the plus two and PG (M.Sc.) levels of Physics by providing a more comprehensive and logical framework in almost all areas of basic Physics.

Aims of the the programme:

- To make students eligible for Higher Studies and professional courses.
- To develop the skills required to gather information from resources and use them.
- To develop the abilities to read, understand and interpret physical information – verbal, mathematical and graphical.
- To provide an intellectually stimulating environment to develop skills and enthusiasms of students to the best of their potential.
- To give need based education in physics of the highest quality at the undergraduate level.
- To offer courses to the choice of the students.
- To enable students to perform experiments and interpret the results of observation, including an assessment of experimental uncertainties.
- To make students eligible for government job.

Objectives:

By the end of the first year (2nd semester), the students should have attained a common level in basic of physics to complement the core for their future courses and developed their experimental and data analysis skills through experiments at laboratories.

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LEARNING OUTCOME :

SEMESTER - 2	**CC-PHY-201**	1	Electrostatics	Learns and understand the basics concepts and the law of electrostatics. Understand the basics concepts of electrostatic energy. Learns and understand how to determine the charge of an electron.
		2	Optics	Refraction Through Lenses This topic aims to provide necessary foundation in optics which prepares the students for an intensive study of advanced topics at a later stage. Covering the very important and fascinating areas of Refraction. Interference This topic aims to provide more specific knowledge of interference and its application.
		3	Waves & Sound	Learns and understand about theory of resonator and its application. Learns the basics of sound. Learns about ultrasonic waves, its production and applications.
		4	Thermodynamics:	Learns and recalls the basic principles and equations. Understand the basic principle and applications of laws of Thermodynamics. Learns about thermodynamic scale of temperature. Understand the central concepts of entropy. Learns how to calculate changes in various thermodynamic processes.
	ES-PHY-02		Electronic circuit elements and energy sources	Learns about various types of resistor, inductor and capacitor. Learns about various types of cells and battery. Learns about transformer working and its applications.

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Hemchandracharya North Gujarat University, Patan

B.Sc. Programme (CBCS-Semester-Grading pattern)

Semester End Examination

Format for Question paper : Elective Courses (Subject) in Physics

BSc : SEM I & II

Time: 2Hrs **Total Marks: 35**

W.E.F. June – 2020

Structure of the Paper in Examination

There will be two questions each of 12 marks. Third question will be of 11 marks.
First question will be from Unit – I.
Second question will be from Unit – II.
Third question will be from Unit – I. and Unit-II.
All the questions are detailed as under.

1 (a)	Attempt any one out of two. (Theory questions)	06 Marks
(b)	Attempt any two out of three. (Application/Example/Problem)	06 Marks
2 (a)	Attempt any one out of two. (Theory questions)	06 Marks
(b)	Attempt any two out of three. (Application/Example/Problem)	06 Marks
3 (a)	Attempt any three out of five. (Short question)	06 Marks
(b)	Attempt any five out of eight. (objective/ MCQ)	05 Marks
	TOTAL 35 MARKS	

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B.Sc. Programme (CBCS-Semester-Grading pattern)

Semester End Examination

Format for Question paper Core Compulsory Courses in Physics

(B.Sc. Sem - I & II)

(W.E.F. JUNE - 2020)

The university examination paper consists of four questions.
First question is of 18 marks and will be from Unit – I.
Second question is of 17 marks and will be from Unit – II.
Third question is of 18 marks and will be from Unit – III.
Forth question is of 17 marks and will be from Unit – IV.
All the questions are detailed as under.

Time: 2.5 Hrs **Total Marks: 70**

1 (a) Attempt any two out of three. (Theory questions)	12 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three or anyone out of two. (Short question)	02 Marks
2 (a) Attempt any two out of three. (Theory questions)	12 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	03 Marks
(c) Attempt any two out of three or anyone out of two. (Short question)	02 Marks
3 (a) Attempt any two out of three. (Theory questions)	12 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three or anyone out of two. (Short question)	02 Marks
4 (a) Attempt any two out of three. (Theory questions)	12 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	03 Marks
(c) Attempt any two out of three or anyone out of two. (Short question)	02 Marks

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Hemchandracharya North Gujarat University, Patan

B.Sc. Programme (CBCS-Semester-Grading pattern)

Semester End Examination

Format for Question paper Core Compulsory Courses in Physics

(B.Sc. Sem - I & II)

(W.E.F. JUNE - 2019)

The university examination paper consists of four questions.

First question is of 18 marks and will be from Unit – I.

Second question is of 17 marks and will be from Unit – II.

Third question is of 18 marks and will be from Unit – III.

Forth question is of 17 marks and will be from Unit – IV.

All the questions are detailed as under.

Time: 2.5 Hrs **Total Marks: 70**

1 (a) Attempt any one out of two. (Theory questions)	07 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three. (Short answer)	04 Marks
(d) Attempt any three out of four. (MCQ)	03 Marks
2 (a) Attempt any one out of two. (Theory questions)	06 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three. (Short answer)	04 Marks
(d) Attempt any three out of four. (MCQ)	03 Marks
3 (a) Attempt any one out of two. (Theory questions)	07 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three. (Short answer)	04 Marks
(d) Attempt any three out of four. (MCQ)	03 Marks
4 (a) Attempt any one out of two. (Theory questions)	06 Marks
(b) Attempt any one out of two. (Application/Example/Problem)	04 Marks
(c) Attempt any two out of three. (Short answer)	04 Marks
(d) Attempt any three out of four. (MCQ)	03 Marks

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Three Year Programme with 144 credits

Pattern to be implemented from June- 2020

General Pattern/Scheme of study components along with credits for Science faculty.

Part/ Class	Course code	Study Components	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
First Year B.Sc.		**Semester-I**					
		Core Compulsory (CC) Course					
	CC-I-1	Core Course-I (Paper-1)	4	30	70	100	4
	CC-II-1	Core Course-II (Paper-1)	4	30	70	100	4
	CC-III-1	Core Course-III (Paper-1)	4	30	70	100	4
		Practical Core (PC) Course					
	PC-I-1	Practical Core Course-I (Paper-1)	4		50	50	2
	PC-II-1	Practical Core Course-II (Paper-1)	4		50	50	2
	PC-III-1	Practical Core Course-III (Paper-1)	4		50	50	2
		Foundation Course (FC)					
	FC-1	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EC-1	Elective (**Generic**) Course –I	2	15	35	50	2
	EC-2	Elective (**Subject**) Course –I	2	15	35	50	2
			30	**135**	**465**	**600**	**24**
First Year B.Sc.		**Semester-II**					
		Core Compulsory (CC)Course					
	CC-I-2	Core Course-I (Paper-1)	4	30	70	100	4
	CC-II-2	Core Course-II (Paper-1)	4	30	70	100	4
	CC-III-2	Core Course-III (Paper-1)	4	30	70	100	4
		Practical Core (PC) Course					
	PC-I-2	Practical Core Course-I (Paper-1)	4		50	50	2
	PC-II-2	Practical Core Course-II (Paper-1)	4		50	50	2
	PC-III-2	Practical Core Course-III (Paper-1)	4		50	50	2
		Foundation Course (FC)					
	FC-2	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EC-3	Elective (**Generic**) Course -II	2	15	35	50	2
	EC-4	Elective (**Subject**) Course –II	2	15	35	50	2
			30	**135**	**465**	**600**	**24**

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B. Sc. :: PHYSICS :: SEMESTER-II
CC PHY-201
(In force from June 2020)

Unit -1 Electrostatics :-

Electrostatics :-

- Gauss's law (4.21), Gauss's law in Differential form (4.22), Gauss's law and Coulomb's law (4.23), Force on the Surface of a charged Conductor (4.25), Electrostatics Energy in the medium surrounding the charged conductor(4.26), Millikan's Oil Drop Method for Determination of Electronic Charge (4.29)
- Related Examples & Problem

Steady Current :-

- Current and Current density (8.6) , Conservation of charge i.e., Continuity Equation (8.8), Ohm's Law at a point (8.11), Wiedmann and franz law (8.13), The Relaxation Time (8.14)
- Related Examples & Problem

Basic Reference :-

Electricity and magnetism By K.K .Tewari (S. Chand & Company Ltd)

Other Reference :-

1. Electricity and magnetism By Mahajan and Rangwala
2. Electricity and magnetism – Berkley Physics Course Vol- II

Unit -2 Optics

Refraction Through Lenses:-

- Principal foci (2.3), Least Possible Distance Between an objet & its real image in a convex lens(2.4), Derivation Produced by a thin lens (2.5), Equivalent Focal Length of two thin lenses Separated by a finite distance (2.6) , Cardinal points of an optical system (2.8), Principal Foci and Focal Planes (2.9), Principal points and principal planes (2.10), Nodal Point (2.11), Aberrations (3.1), Spherical aberration in a lens (3.5), Chromatic aberration (3.12).
- Related Examples & Problem

Interference :-

- Interference in thin films (8.15), Interference due to reflected light (8.16), Interference due to transmitted light (8.17), Newton's Rings (8.23), Determination of the wavelength of sodium light using Newton's Rings (8.24), Refractive index of a liquid Newton's Rings (8.25)
- Related Examples & Problem

Basic Reference :-

A Textbook of OPTICS By N. Subhramanyam & Brij lal (S. Chand & Company Ltd.)

other Reference :-

1. Optics and Atomics Physics by D.P. Khandelval (Himalaya Publishing house)
2. Principal of Optics by B.K Mathur (S. Chand & Company Ltd)
3. Optics by Ajoy Ghatak (TMH Edition)

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Unit- 3 Waves & Sound

Wave:-

- Theory of Resonator (6.16), Dependence of the Frequency of resonator on the size and shape of the mouth (6.17), Velocity of transverse waves along a stretched string (7.1), law's of transverse Vibration of Strings (7.3), Melde's Experiment (7.5), Kundt's Tube (7.13), Related Examples & Problem

Sounds:-

- Musical sound and noise (7.6), Speech(7.17), Human Voice (7.18), Human Ear (7.19), Characteristics of musical sound (7.20), Intensity of sound (7.21), Measurement of intensity of sound (7.22), Bel (7.23), Phon (7.24). Related Examples & Problem

Ultrasonic waves :-

- Ultrasonic (11.23), Production of ultrasonic waves (11.24), Piezo – Electric oscillator (11.24.3), Detection of ultrasonic waves (11.25), Applications of ultrasonic waves (11.27) Related Examples & Problem

Basic Reference :-

Waves And Oscillations By N. Subhramanyam & Brij lal (Vikas Publishing House Pvt. Ltd, New Delhi) – Second Revised Edition.

Other Reference :-

1. University Physics by Sears , Zeemansky and Young (Norosa Publishing House)
2. A Text Book On Oscillations , Wave and Acoustics by M. ghosh & D. Bhattacharya (S. Chand)
3. Vibration , Waves & heat by Sears and Zeemansky.

Unit -4

Thermodynamics

- Second Law of Thermodynamics (2.8) , Carnot's theorem (2.9), Thermodynamic Scale of temperature (2.10), Identity of Perfect Gas Scale and Absolute Scale (2.11), Thermodynamics of Refrigeration (4.2)
- Entropy (2.13), Change of Entropy in a reversible process (2.14), change of entropy in an irreversible process (2.15), Principle of increase of entropy of degradation of energy (2.16), Formulation of the second law in term of entropy (2.17) , Entropy and second law (2.18)
- Third law of Thermodynamics (Nernst's heat theorem) (2.19) T-S diagram of Carnot cycle
- Calculation of Entropy of perfect gas and steam. (2.21),
- Related Examples & Problem

Basic Reference :-

Thermodynemics and Statistical Physics by Dr. J.P. Agarwal and Satya Prakash (Pragati Prakashan)

Other reference ;-

1. Heat and Thermodynamics by Zeemansky
2. University Physics by Sears, Zeemankky and young (Narosa Publishing House)
3. Heat and Thermodynamics by Richard H. Dittmon & Mark W. Zemansky (TMH)
4. Heat and Thermodynamics by A.B. Gupta and H. P. Roy (New Central Book)

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
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B. Sc. :: PHYSICS :: SEMESTER-II
Elective (Subject) Courses
ES PHY-02
Electronic circuit elements And Energy Sources
(In force from June 2020)

UNIT- I PASSIVE CIRCUIT ELEMENT

RESISTOR : Generals(6.1),Resistor type, Wire wound resistor, Carbon composition resistor, Carbon film resi. , Cermete film resi. , Metal film resi., Power resi. , Value tolerance , Variable resistor , Potentiometer and Rheostats , Fusibal resi. , Resistor color , Resi. Colour band , Resi under ten ohm , Resi. Troubles ., Checking resistor with ohmmeter.

INDUCTOR : Inductor , Comparison of different coils , Inductance of an inductance , Another definition of inductance, Mutual inductance, Coefficient of coupling, Variables inductors ,Inductor in series and parallel without M , Series combination with m , Stray inductance , Energy storage magnetic field, DC Resistance of coils ,

CAPACITOR : Capacitors , Capacitor connect to battery , Capacitance , Fators controlling capacitance , Type of Capacitors , Fixed Capacitor , Variable capacitors , Voltage rating of capacitors , Stray circuit cap. Likage resistance , Troubles Capa. , Chacking capa. With ohm meter ,

UNIT—II ENERGY SOURCES
CELLS AND BATTERY

Primary and Secondary cells and Batterys , Voltage and current of cell , Cell life , Different type of dry cells , Carban zink cell , Alkaline cell , Manganese alkaline cell , Nickal cadmium cell , , Mercury cell , Silver oxide cell ,Lead acide cell , Battery rating , Testing dry cell , Photo electric cell , Solar cell

TRANSFORMER: Transformer working , Transformer impedance, Can a Trans. Operate on DC , RF Shilding , Auto Transformer

Book- Basic Electronics by B. L. Theraja , Pub. S. Chand & Compny 3rd Edition

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PC PHY-201
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LABORATORY EXPERIMENTS

1. Bar Pendulum : Determination of 'K' and 'g'
2. Melde's Experiment.
3. Find out Refractive index of the prism using spectrometer.
4. To determine the ratio of magnetic moments of two magnets by using Vibrational magnetometer.
5. To determine the magnetic moment of a given Bar magnet using deflection Magnetometer in Gauss A and B position.
6. Determination of self inductance 'L' of Inductor.
7. Study of parallel resonance with frequency variation.
8. Study of transformer.
9. P-N Junction diode as Full Wave Rectifier (i) Without filter (ii) With Series Inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of Regulation.
10. Bridge Rectifier (i) Without filter (ii) With Series inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of regulation.
11. Verification of Maximum power transfer theorem.
12. Decay of Potential across condenser.

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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. STATISTICS

Syllabus/ scheme

Semester – 2

Sem./CBCS/Grading pattern

w. e. f. June-2020

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B.SC. SEM-II

Programme Name	Bachelor of Science
Semester	Second
Paper No.	CC-STAT-201
Course name	Probability Theory
Course Type	Core
Effective From	Dec – 2020

Unit No.	Content	Marks	Credit
1.	**Probability** Random Experiment, trial, sample point, sample space, definition of equally likely, mutually exclusive and exhaustive events. Definition of probability: classical, relative and axiomatic approach and its properties. Conditional probability, multiplicative law of probability, independence of events, law of total probability, Bayes theorem and its applications.	25%	1
2.	**Random Variable and Generating Functions** Random Variable (rv) with its types, probability mass function (pmf), probability density function (pdf), cumulative distribution function (cdf) with illustrations. Expectation of Random variables with properties, moments, factorial moments, measures of location, skewness, kurtosis, probability generating function (pgf), moment generating function (mgf), cumulant generating function (cgf), factorial moment generating function (fmgf) with their properties and uses	25%	1
3.	**Probability Inequalities** Boole's inequality, Bonferroni's inequality, Markov's inequality, Chebyshev's inequality (one sided and two sided), concept of convex and concave functions, Jensen's inequality, Cauchy- Schwarz inequality.	25%	1
4.	**Joint Distribution** Concept of Joint Distributions, Joint probability mass function and Joint probability density function. Marginal and conditional distributions, independence of random variables, conditional expectation and conditional variance. Product moments.	25%	1

Reference Books for Paper STA-103

1. Introduction to the Practice of Statistics, Moore, S. David; McCabe, P. George W. H. Freeman and Company, New York.
2. Basic Statistics, Agarwal, B. L., New Age International (P) Ltd.
3. Introduction to the theory of Statistics, Mood, A. M., Greybill, F.A., Boes, D.C., Mc Graw Hill.
4. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand and Sons, New Delhi.
5. Mathematical Statistics, P. Mukhopadhyay, New Central Book Agency (P) Ltd, Calcutta
6. An Introduction to Probability and Statistics, V. K. Rohatgi and A.K.Md. Ehsanes Saleh, Wiley Series.

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SEM – II

Programme Name	Bachelor of Science
Semester	Second
Paper No.	PC-STAT-201
Course name	Probability Theory
Course Type	Core
Effective From	Dec – 2020

Unit No.	Content	Marks	Credit
1.	**Manual** 1. Practical based on probability from the given data and bivariate table. 2. Practical based on Bayes theorem 3. Practical based on skewness and kurtosis. 4. Practical based on marginal and conditional distributions. 5. Practical based on moments of joint, marginal and conditional distributions.	50%	1
2.	**Computer** 1. Practical based on probability from the given data and bivariate table. 2. Practical based on Bayes theorem 3. Practical based on skewness and kurtosis. 4. Practical based on marginal and conditional distributions. 5. Practical based on moments of joint, marginal and conditional distributions	50%	1

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B.SC – SEM – II

Programme Name	Bachelor of Science
Semester	Second
Paper No.	ES-STAT-12
Course name	Economic Statistics
Course Type	Elective Opt.
Effective From	Dec – 2020

Unit No.	Content	Marks	Credit
1.	Introduction – Concepts of Demand Supply and Cost function – elasticity of demand, supply and Cost – Monopoly, Duopoly problem, Simple applications for profit maximization.	50%	1
2.	Utility and Utility Index with simple illustrations – elasticity of substitution for function of production – Study of production functions – properties and application for linear, Cobb – Douglas and CES production functions.	50%	1

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Faculty of Science

B. Sc. Zoology

Syllabus/ scheme

Sem. – 2

Sem./CBCS/Grading pattern

w. e. f. June-2020

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The proposed new structure for B. Sc. course is based on Choice Based Credit System (CBCS) which is in force June-2020.

CBSC Course Pattern

1. This programme is divided into **Six Semesters** (Three Years). The duration of an academic year consists of two semester, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. Each semester has 24 credits and the programme is comprised of total 144 credits.
2. There will be five categories of courses/papers in this programme: CC- Core Course, PC- Practical Core, EG- Elective Generic, ES- Elective Subject and FC- Foundation Compulsory.
3. The theory courses with 4 credits shall have 60 hrs of direct classroom teaching workload (15 weeks × 4). The theory courses with 3 credits shall have 45 hrs of teaching workload (15 weeks × 3) and the theory courses with 2 credits shall have 30 hrs of teaching workload (15 weeks × 2).

Attendance: The attendance rules will be as per the rules and regulation of Hemchandracharya North Gujarat University, Patan.

Medium of Instruction: The medium of instruction shall be Gujarati but students are free to write answers in Gujarati or English in examination.

Language of question paper: Question paper should be drawn in Gujarati and English translation of the questions must be given in the question paper.

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Structure of question paper

1. For four credit course: each syllabus is of 4 units having equal weightage.
2. For two credit course: each syllabus is of 2 units having equal weightage.
3. For question paper of 70 marks (4 credits): each question paper shall have 6 questions:

	Total marks	
Q. 1	14	Must be drawn from Unit 1 and will have one long question of 14 marks OR two short questions of 7 marks each
Q. 2	14	Must be drawn from Unit 2 and will have one long question of 14 marks OR two short questions of 7 marks each
Q. 3	07	10 short questions must be drawn from Unit 1 & 2, out of which student has to answer any 7.
Q. 4	14	Must be drawn from Unit 3 and will have one long question of 14 marks OR two short questions of 7 marks each
Q. 5	14	Must be drawn from Unit 4 and will have one long question of 14 marks OR two short questions of 7 marks each
Q. 6	07	10 short questions must be drawn from Unit 3 & 4 out of which student has to answer any 7.
Total	**70**	

4. For question paper of 35 marks (2 credits): each question paper shall have 3 questions:

	Total marks	
Q. 1	15	Must be drawn from Unit 1 and will have one long question of 15 marks OR three short questions of 5 marks each.
Q. 2	15	Must be drawn from Unit 2 and will have one long question of 15 marks OR three short questions of 5 marks each.
Q. 3	5	7 short questions must be drawn from Unit 1 & 2, out of which student has to answer any 5.
Total	**35**	

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B. Sc. Semester II

Course	Course code	Paper title	Exam duration (Hours)	External marks	Internal marks	Total marks	Teaching hours per week	Credit points
Paper-I	ZL-CC-201	Non-chordates II: Coelomates	2.30	70	30	100	4	4
Paper-II	CC-2	Core Course -2	2.30	70	30	100	4	4
Paper-III	CC-3	Core Course -3	2.30	70	30	100	4	4
Practical Paper-I	ZL-PC-201	Practical (Non-chordates II: Coelomates)	More than 4 hours	50	00	50	4	2
Practical Paper-II	PC-2	Practical Core Course -2	More than 4 hours	50	00	50	4	2
Practical Paper-II	PC-3	Practical Core Course -3	More than 4 hours	50	00	50	4	2
Foundation compulsory.	FC	Compulsory English	2.00	35	15	50	2	2
Generic elective	EG	Generic elective	2.00	35	15	50	2	2
Elective subject Course	ZL-ES-201 **OR** ZL-ES-202	Environmental Pollution and Climate Change **OR** Pest Control Technology	2.00 2.00	35 35	15 15	50 50	2 2	2 2
Total				**465**	**135**	**600**	**30**	**24**

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ZL-CC-201 NON-CHORDATES II: COELOMATES

Unit 1 **15 hrs**

1. General characteristics and classification of phylum Mollusca (up to class)
2. Type study: *Pila* (habit and habitat, external features, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system)
3. Torsion in gastropods
4. Pearl culture

Unit 2 **15 hrs**

1. General characteristics and classification of phylum annelida (up to class)
2. Metamerism in annelida
3. Type study: Leech (habit and habitat, external features, digestive system, respiratory system, excretory system, nervous system and reproductive system)
4. Economic importance of annelids

Unit 3 **15 hrs**

1. General characteristics and classification of phylum arthropoda (up to class)
2. Type study: Cockroach (habit and habitat, external features, body wall, endoskeleton, locomotion, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system)
3. Metamorphosis in insects
4. Useful and harmful insects

Unit 4 **15 hrs**

1. General characteristics and classification of phylum Echinodermata (up to class)
2. Type study: sea star (habit and habitat, external features, body wall, digestive system, circulatory system, water vascular system)
3. Life history, larval development, regeneration and autotomy in star fish
4. General characteristics and classification of phylum Hemichordata (up to class)

References

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition.
2. Pechnik J. A. (2015) Biology of the Invertebrates, McGraw Hill Higher Education. 555 pp. 7th edition.
3. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.
4. EkambaranathaAyyar, M. and T.N. Ananthakrishnan, (1992) Manual of Zoology Vol. 1 (Invertebrata), parts I and II.S. Viswanathan (Printers and Publishers) Pvt. Ltd; Madras. 2.

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ZL-ES-201 ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE

Unit 1 **15 hrs**

1. Air and Noise pollution: sources and effect
2. Water pollution: sources and effect
3. Soil pollution: sources and effect
4. Pollution control methods

Unit 2 **15 hrs**

1. Greenhouse gases and global warming
2. Acid rain and Ozone layer destruction,
3. Effect of climate change on public health
4. Mitigation efforts to deal with climate change

References

1. Verma P. S. and Agrawal V. K. (2010) Cell biology, Genetics, Molecular biology, Evolution and Ecology. S. Chand publications.
2. Singh J. S., Singh S. P. and Gupta S. R. (2014) Ecology, Environmental Science and Conservation. S. Chand publications.
3. Sharma P. D. (2003) Ecology and Environment. Rastogi Publications.

ZL-ES-202 PEST CONTROL TECHNOLOGY

Unit 1 **15 hrs**

1. Classification of pests
2. Insect pest: diversity and details of damage caused by them to human goods
3. Avian pest: diversity and details of damage caused by them to human goods
4. Mammalian pest: diversity and details of damage caused by them to human goods

Unit 2 **15 hrs**

1. Management and control of insect pest
2. Management and control of avian pest
3. Management and control of mammalian pest
4. Integrated pest management

References

1. Mathur R. 2008 Animal behaviour (Rastogi Pub.: India)
2. Shukla, G.S, and Upadhyay V.B., 2000. Economic Zoology, Rastogi Publications Meerut
3. Vasantharaj David, B., Murali Rangan. M.C. and Meera Murali Rangan 1992. Harmful and Insects, Popular Book Depot,Chennai.
4. Vasantharaj David, B. 2001. Elements of economic Entomology, Popular Book Depot, Chennai

ZL-PC-201 NON-CHORDATES II: COELOMATES

List of practical

1. Study of classification of phylum mollusca (up to class) using laboratory specimens, models, slides, charts.
2. Study of classification of phylum annelida (up to class) using laboratory specimens, models, slides, charts.
3. Study of classification of phylum arthropoda (up to class) using laboratory specimens, models, slides, charts.
4. Study of classification of phylum echinodermata (up to class) using laboratory specimens, models, slides, charts.
5. Study of classification of phylum Hemichordata (up to class) using laboratory specimens, models, slides, charts.
6. Study of anatomy of different systems of *Pila* using charts and models.
7. Study of anatomy of different systems of leech using charts and models.
8. Study of anatomy of different systems of cockroach using charts and models.
9. Study of anatomy of different systems of star fish using charts and models.
10. Study of histological structure of pharynx, gizzard, typhlosole and ovary of earthworm using permanent slides
11. Mounting of mouth parts of housefly, honey bee and mosquito.
12. Field trip and report preparation

PRACTICAL EXAM SKELETON

B. Sc. Semester II (Zoology)

Practical: ZL-PC-201 Non-chordates II: Coelomates

Time: 5 hours Total marks: **50**

Date:

1. Mounting of mouth parts of given insect specimen……..……...**09**
2. Draw, label the diagram of given system of particular animal and describe location and functions of different organs in brief……...……**07**
3. Do as directed……..**18**
    1) Identify and describe histological structure
    2) Identify and classify the specimen up to class and describe its morphological characters.
    3) Identify and classify the specimen up to class and describe its morphological characters.
    4) Identify and classify the specimen up to class and describe its morphological characters.
    5) Identify and classify the specimen up to class and describe its morphological characters.
    6) Identify and classify the specimen up to class and describe its morphological characters.
4. Viva voce…...……..**05**
5. Journal……**05**
6. Field trip report submission……**05**

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હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in Website : www.ngu.ac.in

રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦

પરિપત્ર નં.- ૨૭૭ /૨૦૨૩

વિષયઃ વિજ્ઞાન વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના સેમેસ્ટર-૧ અને ૨ના જૂન ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવતા અભ્યાસક્રમ / પરિક્ષા સ્કીમ અંગે.

આ યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા અંતર્ગત વિષયોના સ્નાતક વિભાગો તથા સંલગ્ન વિજ્ઞાન વિદ્યાશાખાની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, એકેડેમિક કાઉન્સિલની તારીખઃ ૧૪/૦૮/૨૦૨૩ની મળેલ સભાના નિર્દિષ્ટ ઠરાવોથી રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦ અંતર્ગત UGCની Guideline તથા રાજય સરકારશ્રીના શિક્ષણ વિભાગના તારીખઃ ૧૧/૦૭/૨૦૨૩ના ઠરાવ નં.કે.સી.જી./એડમીન/૨૦૨૩-૨૪/૦૬૦૭/ખ-૧ થી પ્રકાશિત કરેલ કોમન કરિકયુલમ એન્ડ ક્રેડિટ ફ્રેમવર્ક હેઠળ ક્રેડિટ માળખું તથા પ્રકાશિત કરેલ સ્ટાન્ડર્ડ ઓપરેટીંગ પ્રોસિજર (S.O.P.) મુજબ વિજ્ઞાન વિદ્યાશાખા હેઠળના નીચેના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો શૈક્ષણિક વર્ષઃ ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવે તે રીતે મંજુર કરેલ છે, જેનો અમલ કરવા સારૂ સબંધિતોને આ સાથે મોકલવામાં આવે છે.

ક્રમ નં	અભ્યાસક્રમ	ઠરાવ ક્રમાંક	સેમેસ્ટર
૧	બી.એસ.સી. (ગણિતશાસ્ત્ર)	૧૯	સેમેસ્ટર ૧ અને ૨
૨	બી.એસ.સી. (વનસ્પતિશાસ્ત્ર)	૨૦	સેમેસ્ટર ૧ અને ૨
૩	બી.એસ.સી. (બાયોટેકનોલોજી)	૨૧	સેમેસ્ટર ૧ અને ૨
૪	બી.એસ.સી. (ભૌતિકશાસ્ત્ર)	૨૨	સેમેસ્ટર ૧ અને ૨
૫	બી.એસ.સી. (ઝુલોજી)	૨૩	સેમેસ્ટર ૧ અને ૨
૬	બી.એસ.સી. (રસાયણશાસ્ત્ર)	૩૨	સેમેસ્ટર ૧ અને ૨

સદર બાબતની જાણ આપના સ્તરેથી અધ્યાપકશ્રીઓ તથા વિદ્યાર્થીઓને કરવા વિનંતી છે.

નોંધઃ

(૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજના / ડિપાર્ટમેન્ટના ગ્રંથાલયમાં મૂકવાની રહેશે.

(૨) આ પરિપત્ર યુનિવર્સિટીની વેબસાઇટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરવામાં આવેલ છે. આથી સંબંધિત કોલેજોને ડાઉનલોડ કરી ઉપયોગ કરવા સારૂ જણાવવામાં આવે છે.

(૩) <u>વિજ્ઞાન વિદ્યાશાખા</u> વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના પ્રોગ્રામ્સના અભ્યાસક્રમોનો પરિપત્ર નં.૧૩૦/૨૦૨૩, તારીખઃ૨૩/૦૬/૨૦૨૩ રદ કરવામાં આવે છે.

બિડાણઃ ઉપરમુજબ

કા. કુલસચિવ

નં-એકે/અ×સ/૩૨૬૪/૨૦૨૩

તારીખઃ૩૧/૦૮/૨૦૨૩

પ્રતિ,

૧. ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા તરફ.
૨. વિજ્ઞાન વિદ્યાશાખા હેઠળની કોલેજોના આચાર્યશ્રીઓ તરફ
૩. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૪. ગ્રંથપાલશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૫. માન.કુલપતિશ્રી/કુલસચિવશ્રીનું કાર્યાલય હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૬. સિસ્ટમ એનાલીસ્ટશ્રી, કોમ્પ્યુટર (રીઝલ્ટ સેન્ટર) હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ.(વેબસાઇટ પર મુકવા સારૂ)
૭. પ્રવેશ પ્ર-શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ
૮. મહેકમ શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ.(૨ નકલ)

Curriculum and Credit Framework For SEM I and II
Asper UGC Guideline
(According to NATIONAL EDUCATION POLICY (NEP) – 2020)

Submittedon21st July 2023

Introduction:

The UniversityGrantsCommission (UGC)hasinitiatedseveralmeasuresto bringequity,efficiency and excellence in the Higher Education System of country. The important measurestaken to enhance academic standards and quality in higher education include innovation andimprovements in curriculum, teaching-learning process, examination and evaluation systems,besidesgovernanceandothermatters.

The UGC has formulated various regulations and guidelines from time to time to improve thehighereducationsystemandmaintainminimumstandardsandqualityacrosstheHigherEducational Institutions (HEIs) in India.The academic reformsrecommended by the UGCinthe recent past have led to overall improvementin the higher education system.However,dueto lot of diversity in the system of higher education, there are multiple approaches followed byuniversitiestowardsexamination,evaluation and grading system.While the HEIsmusthavethe flexibility and freedom in designing the examination and evaluationmethodsthat bestfitsthe curriculum,syllabi and teaching–learning methods,there is aneed to devise asensiblesystemforawardingthegradesbasedontheperformanceofstudents.

The National Education Policy (NEP)2020(hereafterreferred to as NEP or Policy)recognizesthathighereducation plays an extremelyimportantrole in promoting human aswellassocietalwell-beingandindevelopingIndiaasenvisionedinitsConstitution-ademocratic, just, socially conscious, cultured, and humane nation upholding liberty, equality,fraternity, andjusticefor all. It notes that "giventhe 21st-centuryrequirements,qualityhighereducationmustaimtodevelopgood,thoughtful,well-rounded,andcreativeindividuals". In accordance with the NEP2020, the UGC hasformulatedanewstudent-centric"CurriculumandCreditFrameworkforUndergraduateProgrammes(CCFUP)"incorporating a flexible choice-based credit system, multidisciplinary approach, and multipleentry and exit options. This will facilitate students to pursue their career path by choosing thesubject/fieldoftheirinterest.Thegradingsystemisconsideredtobebetterthantheconventional marks system and hence it has been followed in the top institutions in India andabroad. Soitisdesirable tointroduceuniform gradingsystem. This willfacilitate studentmobilityacrossinstitutionswithinandacrosscountriesandalsoenablepotentialemployersto assessthe performance ofstudents. To bringin the desired uniformity,in grading systemandmethodforcomputingthecumulativegradepointaverage(CGPA)basedontheperformanceofstudentsintheexaminations,theUGChasformulatedtheseguidelines.

NEP-2020

NEP,2020 aimsat a new and forward-looking Vision forIndia'sHigherEducation System.Thiscurriculum framework forthe bachelor-level program in PHYSICSisdeveloped keepingin view of the student centric learning pedagogy, which is entirely multidisciplinary outcome-orientedandcuriosity-driven.Toavoidrote-learningapproachandfosterimagination,thecurriculumismoreleanedtowardsself-discoveryofconcepts.Thecurriculumframeworkfocuses on pragmatist approach whereby practical application of theoretical concepts is taughtwithsubstantialcoverageofpracticalandfieldworks.

Theplatformaimsatequippingthegraduateswithnecessaryskillsfor PHYSICS-

relatedcareers,careerswithgeneralgraduate-level aptitudeandforhighereducationinPHYSICS.Augmentedinthisframeworkaregraduateattributesincludingcriticalthinking,basicpsychology,scientificreasoning,moralethicalreasoningandsoon.

Learningoutcomesforthetwoprogrammestheseframeworkshavebeendeveloped,learning outcomes for individual courses, pedagogical methods and assessment methods. Looking at allthese new concepts and progress,the detailed syllabus ofB.Sc.(Honours)–PHYSICShasbeendesignedanddecidedtobeimplementedfromtheacademicsessionfromJune 2023-24.

PROGRAMMESPECIFICOUTCOMESTOBEATTAINEDATTHEENDOFTHEPROGRAMME

AccordingtoGuidelineofNEP2020,theBoardofStudiesinPhysicsrecognizesthatcurriculum,course contentand assessmentofscholasticachievementsplay important rolesin shapingeducation.The committee isof the view thatassessmentshouldsupportandencourage the broad instructional goals such as basic knowledge of the discipline of Physicsincludingphenomenology,theoriesand techniques,conceptsandgeneral principles.Thisshould alsosupportthe abilityto ask subjective questionsand to obtainitssolutionsby useof qualitative andquantitative reasoning and by experimental investigation.Withthisinmind, we aim to provide a firm foundation in every aspect of Physics ranging from a broadspectrum of modern trends in Physics toexperimental,computationaland mathematicalskillsof students.Hence, theUG(B.Sc.)syllabihasbeenframedinsucha waythatitbridges the gap between the plus two and PG (M.Sc.) levels of Physics by providing a morecomprehensiveandlogicalframeworkinalmostallareasofbasicPhysics.

AimsofthetheProgramme:

- TomakestudentseligibleforHigherStudiesandprofessionalcourses.
- Todeveloptheskillsrequiredtogatherinformationfromresourcesandusethem.
- Todeveloptheabilitiestoread,understandandinterpretphysicalinformation–verbal, mathematicalandgraphical.
- Toprovideanintellectuallystimulatingenvironmenttodevelopskillsandenthusiasmsofstudentstothebestoftheirpotential.
- Togiveneedbasededucationinphysicsofthehighestqualityattheundergraduatelevel.
- Tooffercoursestothechoiceofthestudents.
- To enablestudentstoperformexperimentsandinterprettheresultsofobservation,includinganassessmentofexperimentaluncertainties.
- Tomakestudentseligibleforgovernmentjob.

ObjectivesofProgramme:

Bytheendofthefirstyear(2ndsemester),thestudentsshouldhaveattainedacommonlevelinbasicofphysicstocomplementthecorefortheirfuturecoursesanddevelopedtheirexperimentalanddataanalysisskillsthroughexperimentsatlaboratories.

OUTLINEOFCHOICEBASEDCREDITSYSTEM

1. **Major Course (MJDSC):** A course, which should compulsorily be studied by a candidate as a corerequirementistermedasa***MajorDisciplinespecificcourse***.
2. **Minor discipline (MiDSC)** helps a student to gain a broader understanding beyond

themajordiscipline.

3. **Multidisciplinary Course (MDSC):** Generally,acoursewhich canbechosenfrom apool of courses and which may be very specific or specialized or advanced or supportive tothe discipline/ subject of study or which provides an extended scope or which enables anexposuretosomeotherdiscipline/subject/domainornurturesthecandidate'sproficiency/skilliscalledanElectiveCourse.
4. **Interdisciplinary Course (IDSC) Course:** Elective courses may be offered by the maindiscipline/subjectofstudyisreferredtoasDisciplineSpecificElective.The University/InstitutemayalsoofferdisciplinerelatedElectivecoursesofinterdisciplinarynature(tobeofferedbymaindiscipline/subjectofstudy).
5. **Ability Enhancement Courses (AEC):** Environmental Science, English Communication/MILCommunication aremandatoryforalldisciplines.
6. **SkillEnhancementCourses(SEC):**
   Thesecoursesmaybechosenfromapoolofcoursesdesignedtoprovidevalue-basedand/orskill-basedinstruction.
7. **ValueAddedCourses(VAC):**
   Thesecoursesmaybechosenfromapoolofcoursesdesignedtoprovidevalue-basededucation course instruction.
   The Proposed new course sinchemistry forunder graduate class esare reassignedin accordance to semester/CBCS/Grading system with new education policy.The new course is based on model curriculum of the university grants commission.

COURSES/ACTIVITIESUNDERTHEPROGRAM:

1. **Lecture courses**: Courses involving lectures relating to a field or discipline by an expertor qualifiedpersonnelinafieldoflearning,work/vocation,orprofessionalpractice.
2. **Tutorialcourses:**Coursesinvolving problem-solving and discussionsrelating to afieldordisciplineundertheguidanceofqualifiedpersonnelinafieldoflearning,work/vocation,orprofessionalpractice.
3. **Practicum or Laboratory work:** A course requiring students to participate in a project orpractical or lab activity that appliespreviously learned/studied principles/theory related tothe chosen field of learning,work/vocation,orprofessional practice underthe supervisionof an expert or qualified individual in the field of learning, work/vocation or professionalpractice
4. **Seminar:**Acourserequiringstudentstoparticipateinstructureddiscussion/conversationordebate focused on assigned tasks/readings,currentorhistorical events, orsharedexperiencesguidedorledbyanexpertorqualifiedpersonnelinafieldoflearning,work/vocation,orprofessionalpractice.
5. **Internship:** A course requiring students to participate in a professional activity or workexperience,orcooperativeeducationactivitywithanentityexternaltotheeducationinstitution, normally under the supervision of an expert of the given external entity. A keyaspectoftheinternshipisinductionintoactualworksituations.Internshipsinvolveworking with local industry, government or private organizations, business organizations,artists, crafts persons, and similar entities to provide opportunities for students to activelyengageinon-siteexperientiallearning.
6. **Studio activities:** Studio activities involve the engagement of studentsincreativeorartistic

activities. Every student is engaged in performing a creative activity to obtain aspecific outcome. Studio-based activitiesinvolve visual- or aestheticfocused experientialwork.

7. **Fieldpractice/projects:**Coursesrequiringstudentstoparticipateinfield-basedlearning/projectsgenerallyunderthesupervisionof anexpertof thegivenexternalentity.
8. **Community engagement and service:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given externalentity.The curricularcomponentof 'communityengagementandservice'willinvolveactivities that would expose students to the socio-economic issues in society so that thetheoretical learning'scan be supplemented by actuallife experiencesto generate solutionstoreal-lifeproblems.

SILENT FEATURES:

- B.Sc. (Honours) Physics in UG Programme - Semester I and II shall be offered from theAcademicyear,June2023.
- Physicssubjectin the Universities/Affiliated Collegesshall offerundergraduate programmeinFacultyofSciencefromtheAcademicyear2023-24.
- ❖ A student will have to get enrolled a Discipline Specific Core Course (DSC) depending uponhis/her requirement of a degree in the said discipline of study. A student will have a choice ofselecting an Inter/MultidisciplinaryCourse(IDC/MDC),AbilityEnhancementCourse(AEC),SkillEnhancementCourse(SEC)aswellasValueAddedCourse(VAC)fromapoolofcourses.
- Eachcourse shallbe assignedaspecificnumberofCredits.
- Discipline SpecificCore Course(DSC) is the course which shouldcompulsorily be studiedby a candidate as a Major and Minor requirement so as to get degree in a said discipline ofstudy.
- There shall be One Major(MDSC) and Minor(MiDSC) Compulsory course (Theory)eachwith3creditineachsemesterandtheirpractical'seachwith2credit.
- One IDC/MDC course shall have to be offered. The credit weight-age for MD shall be of 2 creditineachsemesterandtheirpractical'seachwith2credit.
- In addition to the Major/Minorcourse,astudent willhave to choose IDC/MDC,AEC, SECaswellasVACfromapoolofcourses.
- SEC and VAC courses shall have to be offered. The credit weight-age for SEC shall be of 2 creditsandVACcourseshallbeof2credit.
- One AEC(Languages)course shall have to be offered.The creditweight-age forAbilityEnhancementCourse(AEC)shallbeof02credit.
- EachcourseshallhaveauniqueCoursecode.TheDisciplineSpecificCoreCourse,Inter/Multi-Disciplinary Course, Ability Enhancement Course, ValueAddedCourse andSkillEnhancementCourseshallbeabbreviatedrespectivelyas**DSC(Major/Minor),IDC/MDC,AEC,VACandSEC.**
    1. DisciplineSpecificCoreCourse**DSC(Major/Minor),** PracticalDiscipline SpecificCore Course**PDSC**
    2. Inter/Multi-Disciplinary Course**IDC/MDC,** PracticalInter/Multi-DisciplinaryCourse**PIDC/PMDC**
    3. AbilityEnhancementCourse(Languages)**AEC**
    4. ValueAddedCourse**VAC**
    5. SkillEnhancementCourse**SEC**
- EachAcademicyearshallconsistof**two**semesters,eachof**15weeks**ofteachingequivalentto **90 working days**. The Odd semester period shall be from **July to November** and the Evensemesterperiodshallbefrom**DecembertoApril**.
- The coursewith**4credit**shallbeof**60Hours**(15weeksx4credits)duration,
- Thecoursewith**3credit**shallbeof**45Hours**(15weeksx3credits)durationand

- Thecoursewith**2credit**shall beof**30Hours**(15weeksx2credits)duration.
- **Practicalwith2Credit**shallbeof**60Hours**(15weeksx4hours)duration.
- **Practicalwith4 Credit**shallbeof 120**Hours**(15weeksx8hours)duration.

ATTENDANCE:

The attendance rules asper the norms of Hemchandracharya North Gujarat University,Patan.

MEDIUMOFINSTRUCTION:

TheMediumofInstructionshallbeof**Gujarati medium**. Studentisfree towriteanswerseitherin**Gujarati**and/or**English**language.

TEACHINGLEARNINGPROCESS:

Teachingandlearninginthisprogrammeinvolveclassroomlecturesaswelltutorials. Itallows-

- ❖ Thetutorialsallowacloserinteractionbetweenthe studentsandtheteacheraseachstudentgetsindividualattention.
- ❖ Writtenassignmentsandprojectssubmittedbystudents
- ❖ Project-basedlearning
- ❖ Groupdiscussion
- ❖ Homeassignments
- ❖ Quizzesand ClassTests
- ❖ PPTpresentations,Seminars,interactivesessions
- ❖ Diversitysurvey
- ❖ Co-curricularactivityetc.
- ❖ IndustrialTourorFieldvisit

LANGUAGEOFQUESTIONNPAPER:

Questionpapershouldbedrawnin**Gujarati**languageandits**English**versionshouldbegiven.

EVALUATIONMETHOD :

Academic performance in various courses *i.e.* **MJDSC, MIDSC, IDC/MDC,AEC, VAC** and **SEC** are to beconsideredas parameters forassessing the achievementof students inthe PHYSICS subject.Anumber of appropriate assessment methodsofPHYSICSwillbe used to determine the extent towhichstudentsdemonstratedesiredlearningoutcomes

Followingassessmentmethodologyshouldbeadopted:

- Theoralandwrittenexaminations(Scheduledandsurprisetests),
- Closed-bookandopen-booktests,
- Problem-solvingexercises,
- Practicalassignmentsandlaboratoryreports,
- Observationofpractical skills,
- Individualandgroupprojectreports,
- Efficientdeliveryusingseminarpresentations,
- Vivavoceinterviewsaremajorlyadoptedassessmentmethodsforthiscurriculum.
- The computerized adaptivetesting,literaturesurveysandevaluations,peersandself-assessment,outputsformindividualandcollaborativeworkarealsootherimportantapproachesforassessmentpurposes.
- AstudentshallbeevaluatedthroughComprehensive Continuous Assessment(**CCA**)/(***InternalEvaluation***)aswellastheEndofSemester **E xamination**(SEE ***ExternalEvaluation***).Theweight-ageofCCAshallbe50%,whereastheweight-

ageoftheSemesterendexaminationshallbe50%.Therewillbe**nointernalevaluationin practicalcourses.**

- InSemesterassessment(**CCA**)/(**InternalEvaluation**)isspreadthrough thedurationofthecourseandistobedonebytheTeacherteachingthecourse.BoSofthes ubjectswilldecidevariouscriteriaandtheirweight-ageforCCA.Theassessmentistobedonebyvariousmeansincluding:
    - Written Tests,MCQsbasedTests/Quiz
    - Presentations/Seminars
    - Groupdiscussions/Groupactivities
    - Assignmentsetc.,Projectwork/Fieldwork

Sr No	Assessment	4 Credit Course Marks	2 Credit Course Marks
1	CCE (50%) Classroom and Internal Evaluation	50	25
2	SEE Semester End Exam (50%)	50	25
Total		100	50

- ThedistributionofInternalEvaluation CEEisgivenaspercriteriagivenbelowfor15Marks.

WrittenTest/Weekly (2 Test Best out of 3)	20Marks
Quiz (2 Test Best out of 3)	10 Marks
Active Learning During whole Term	10 Marks
Home Assignments	05Marks
Attendance-Regularityin Learning, WrittenTestandActivity	05Marks
Total CEE	50 Marks

- **SCHEMEOFASSESMENTin Uni.ExaminationforEachPractical**

No.	Nameofthehead	Marks
1.	Understandingandapproachtotheexperiment,circuitlayout,use of apparatus	05
2.	Tabulationwithcorrectunitsandaccuracy ofreading,whichisread andnotedbythestudentandverifiedbyexaminer.	05
3.	OralquestionsRegardingtheexperiment(Viva)	07
4.	Calculationsbycorrectformulaandgraphwithscale.	05
5.	Accuracyoftheresultasjudgedbycomparingthestudentsresults withthosesuppliedbyexpertassistantwhohassettheexperiment.	01
6.	Marksforjournal.	02
Total		25

Therewill be two group of practicalseach of 2 credit and 1 credit = 25 Marks, Total Marks of both Group will be 100. Students have must attend both group of practical in practical examination.

- The**Endof Semesterexamination**(***ExternalEvaluation***)shallhavean assessmentbaseduponfollowingperspectivewithrespecttoallthecourses:
    - EvaluationwithrespecttoKnowledge,
    - EvaluationwithrespecttoUnderstanding,
    - EvaluationwithrespecttoSkill,

- EvaluationwithrespecttoApplicationand
- HigherOrderThinkingSkills.

- Withrespecttoalltheabovecomponents,thereshallbefollowingtypesofQuestionsfromeachunitofthecourse.
  - MCQs/Fillintheblanks/Matchthepairs,etc
  - Shortanswerquestions
  - Mediumanswerquestions
  - Longanswerquestions, Examples/Problems,etc.

- **CERTIFIED JOURNAL:**
  TheEndofSemesterExaminationwillbeconductedbytheUniversity.A***certifiedjournal***of therespectivepracticalcourse**mustbeproduced**atthe timeofpracticalexaminationbythestudent.

- Itwillbecompulsory foracandidate to obtain ***passingpercentage***in bothInternal aswellasExternalEvaluation.Thepassingmarksforeachcourseshallbe**40%**asdecided byconcernBoardofStudiesinPhysics.

- Promotion,Re-AdmissionandTimeforCompletionofCourse, Procedure forAwardingGrades,ProvisionforAppeal,etc.asdecidedbytheHemchandrachary aNorthGujaratUniversity.

AwardingCertificates,DiplomasandDegrees:

CertificateinScience:

Students who opt to exit after completion of the first year and have secured 48 credits will beawarded the Certificate in Science with the three disciplines chosen by student in the first year.Thus, for example, if a studentof B.Sc. program with Physicsas the Major discipline and MathsastheminordisciplinesandChemistryasinterdisciplinesoptstoexitaftersuccessfulcompletion of the firstyear, the studentwill be awarded *"Certificate in Science with Physics,MathsandChemistry".*

DiplomaofScience:

Students who opt to exit after completion of the second year and have secured 92 credits will beawarded the Diploma of Science in the principal discipline.Thus, for example,if a student ofB.Sc.program with Physicsas theMajordisciplineoptsto exitaftersuccessful completionoftwoyears,thestudentwillbeawarded*"DiplomaofScienceinPhysics".*

BachelorofScience:

Students who opts to exit after completion of the third year and have secured 132 credits will beawardedtheBachelorofScienceintheMajor(principal)discipline.

BachelorofScience(Honors):

Studentsof4-yearB.Sc.programwhosuccessfullycomplete4years,withoutarigorousresearch project/ dissertation will be awarded the Bachelorof Science (Honors) in the Majordiscipline(principaldiscipline).

BachelorofScience(HonorswithResearch):

Students of 4-year B.Sc. program who successfully complete 4 years, with a rigorous

researchproject/dissertationwillbe awarded the BachelorofScience (Honors with research)in theMajordiscipline(principaldiscipline).

- **Note:**During the preparation of this curriculum, ample care is taken for consideration of thefollowings:
  (a) NEP-2020
  (b) ModelcurriculumofU.G.C.
  (c) National CreditFrameworkReportofUGC,2023
  (d) Conceptofcontinuousevaluation
  (e) CGPA (CumulativeGradePointAverageCredit)
  (f) CBCS(Choice BasedCreditSystem)
  (g) Semesterapproach
  (h) RevisedrulesandregulationofHemchandracharyaNorthGujaratUniversity,Patan.

  Thereshallbecoverageofmaximum30%syllabusthroughonlinemodeofteaching.AsperdirectivesofUGC.

Arrangement of credit Distribution Framework for three/four years Honours/Honours with Research Degree Programme with Multiple Entry and Exits options for all the institutions:

OPTION I BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
NCrF Credit Level	Semester	Major (Core) (68/88)	Minor (Electives) (32)	Multi/Inter-disciplinary (12)	AEC (10)	SEC/ Internship (12)	VAC/ IKS (8)	RP/ OJT	Total Credit/ Sem. (144/176)	Qualification / Certificate
4.5 1st Year	I	8	4	4	2	2 (SEC)	2 (IKS)	-	22	**UG Certificate**
	II	8	4	4	2	2 (SEC)	2	-	22	
First Year Total Credits		**16**	**8**	**8**	**4**	**4**	**4**	**-**	**44**	
Exit1: Award of UG certificate in Major course with 44 credits with additional 4credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor										
5.0 2nd Year	III	12	-	4	2	2 (SEC)	2 (IKS)	-	22	**UG Diploma**
	IV	12	4	-	2	2 (SEC)	2 (VAC)	-	22	
Second Year Total Credits		**40**	**12**	**12**	**8**	**8**	**8**	**-**	**88**	
Exit 2 : Award of UG Diploma in Major course with 88 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor										
5.5 3rd Year	V	12	8	-	-	2 (SEC)	-	-	22	**UG Degree**
	VI	12	4	-	2	4(Internship)	-	-	22	
Third Year Total Credits		**64**	**24**	**12**	**10**	**14**	**8**	**-**	**132**	
Award of UG Degree in Major course with 132 credits and Internship in core discipline OR continue with Major and Minor course for next NCrF credit level										
6.0 4thYear	VII	12	4	-	-	-	-	6 (OJT)	22	**UG Honours Degree**
	VIII	12	4	-	-	-	-	6 (OJT)	22	
Fourth Year Total Credits		**88**	**32**	**12**	**10**	**14**	**8**	**12**	**176**	
Award of UG Honours Degree in Major (without Research)course with total 176 credits										
OPTION II BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
6.0	VII	12	4	-	-	-	-	6 (RP)	22	**UG Honours with Research Degree**
	VIII	12	4	-	-	-	-	6 (RP)	22	
Fourth Year Total Credits		**88**	**32**	**12**	**10**	**14**	**8**	**12**	**176**	
Award of UG Honours with Research Degree in Major course with total 176 credits										

Abbreviation: AEC -Ability Enhancement Course, IKS-Indian Knowledge System, NCrF-National Credit Framework OJT-On-the-Job Training, VAC-Value Added Course, SEC-Skills Enhancement Course, RP- Research Project

GeneralCredit-SubjectStructure and Examination Pattern /MarkingSchemeofstudy componentsalongwith22creditsinB.Sc.PHYSICS SEM – 1 and 2 are as below.

Sr. No.	Course Code	StudyComponents	InstructionHrs/	Examination			Credit	Exam Duration(Ho
				Internal	Uni .Exam	Total		
SEMESTER–I PROGRAMCODE:SCIUG101								
TheoryCourse(DSC)								
1	SC23MJDSCPHY101	Major-1:DisciplineSpecificCoreCourse	04	50	50	100	4	02:30
2	SC23MIDSCPHY102	Minor:DisciplineSpecificCore Course	02	25	25	50	2	02:00
3	SC23MDCPHY103	Inter/MultiDisciplinary Courses	02	25	25	50	2	02:00
PracticalCourse(PDSC)								
4	SC23PMJDSCPHY101(A)	Major:DisciplineSpecificCoreCourses	04	25	25	50	2	2:30
5	SC23PMJDSCPHY101(B)	Major:DisciplineSpecificCoreCourse	04	25	25	50	2	2:30
6	SC23PMIDSCPHY102	Minor: Discipline SpecificCoreCourse	04	25	25	50	2	2:30
7	SC23PMDCPHY103	Inter/MultiDisciplinary Course	04	25	25	50	2	2:30
AbilityEnhancementCourses(AEC)								
8	SC23AECPHY104	(AEC)(Languages)	02	25	25	50	2	1:30
ValueAdded Course(VAC)								
09	SC23VACPHY105	ValueAddedCourses(VAC)	02	25	25	50	2	1:30
SkillEnhancementCourse								
10	SC23SECPHY106 &106(A)	**SkillEnhancementCourse(SEC)**	02	25	25	50	2	1:30
Total			30	275	275	550	22	

SEMESTER–IIPROGRAMME CODE : SCIUG101

Sr. No.	CourseCode	StudyComponents	InstructionHrs/w	Examination			Credit	Exam Duration(Ho
				Internal	Uni .Exam	Total		
SEMESTER– II PROGRAMCODE:SCIUG101								
TheoryCourse(DSC)								
1	SC23MJDSCPHY201	Major-1:DisciplineSpecificCoreCourse	04	50	50	100	4	02:30
2	SC23MIDSCPHY202	Minor:DisciplineSpecificCore Course	02	25	25	50	2	02:00
3	SC23MDCPHY203	Inter/MultiDisciplinary Courses	02	25	25	50	2	02:00
PracticalCourse(PDSC)								
4	SC23PMJDSCPHY201(A)	Major:DisciplineSpecificCoreCourses	04	25	25	50	2	2:30
5	SC23PMJDSCPHY201(B)	Major:DisciplineSpecificCoreCourse	04	25	25	50	2	2:30
6	SC23PMIDSCPHY202	Minor: Discipline SpecificCoreCourse	04	25	25	50	2	2:30
7	SC23PMDCPHY203	Inter/MultiDisciplinary Course	04	25	25	50	2	2:30
AbilityEnhancementCourses(AEC)								
8	SC23AECPHY204	(AEC)(Languages)	02	25	25	50	2	1:30
ValueAdded Course(VAC)								
9	SC23VACPHY205	ValueAddedCourses(VAC)	02	25	25	50	2	1:30
SkillEnhancementCourse								
10	SC23SECPH206 &206(A)	**SkillEnhancementCourse(SEC)**	02	25	25	50	2	1:30
Total			30	275	275	550	22	

Note: A student will allow to switch over minor to major course after finishing second semester. For that He/She must earn credits equal to credits of major subject during first two semesters simultaneously.

Semester	First Year B Sc Sem I & II Credit and Theory –Practical Distribution						
	DisciplineSpecificCoreCourses		Inter/Multi Disciplinary Course (4)	AbilityEnhancementCourse (Languages) (2)	ValueAddedCourse (2)	SkillEnhancement Course (2)	TotalCredit
	Major (8)	Minor (4)					
	Theory+ Practical Credit	Theory+ Practical Credit	Theory+ Practical Credit	Credit	Credit	Credit	
I	4 T + 4 P = 8 [In Practical 2 of Group A and 2 of Group B]	2 T + 2 P = 4	2 T + 2 P = 4	2 T	2 T	2 T	22
II	4 T + 4 P = 8 [In Practical 2 of Group A and 2 of Group B]	2 T + 2 P = 4	2 T + 2 P = 4	2 T	2 T	2 T	22

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN
B.Sc.PHYSICS-SEMESTER–I
TYPEOFCOURSE:MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 **COURSECODE:SC23MJDSCPHY101**

COURSENAME:Mathematical,Thermodynamics, Waves-Sound and Electronics

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:04 TeachingHoursperWeek:04TeachingHoursperSemester: 60	Theory	ExternalMarks-50 InternalMarks-50

CourseObjective:

1. ToUnderstandtheconceptsandsignificanceofScalarandVectorFields,operationswithoperator∇andGauss'sTheorem,Stoke'sTheorem
2. ToUnderstandtheapplicationsoflawsofThermodynamics&theconceptsofentropy.
3. ToteachhowtocalculatechangesinvariousThermodynamicprocesses.
4. Todevelopknowledgeabouttheoryofresonatoranditsapplication,ultrasonicwaves,its production and application
5. Todevelpoeknowledgeabout basic concepts, working of various rectifier and Filter circuits.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

1. Understands the concepts and significance of Scalar and Vector Fields as well as operations of operator ∇,Gauss'sTheoremandStoke'sTheorem.
2. UnderstandstheThermodynamics,Carnot'stheoremandconceptsofentropy.
3. LearnsaboutUltrasonics, productionanditsapplications.
4. WillGetsufficientknowledgeofsoundandtheoryofresonator.
5. Learns sufficient knowledge of various rectifier, Filter circuits and applications of them.

Syllabus

Unit No.	Content	Credit	Lect. Hrs60
Unit-1	**MathematicalPhysics:** **VectorAlgebraandVectorAnalysis:** Dyadic(1.10),ScalarTripleproduct(1.11),Reciprocalvectors(1.12),VectorTripleproduct(1.13),PseudovectorsandPseudoScalars(1.16), SomeImportant DefinitionaboutVectors,Integrationofvector:LineIntegration,SurfaceIntegrationandVolume Integration(2.3a,b), Partial differentiation(2.4), Gradient of a scalarpoint function(2.5), Divergence of vector(2.6), Curl of a vector(2.8), MoreabouttheVectordifferentialOperator*A*(2.9),MultipleDelOperations(2.11),Someusefulidentities(2.13),Gauss'Theorem(2.14),StokesTheorem(2.17). (*RelatedExamples&Problems*) **BasicReference:***IntroductiontoClassicalMechanicsbyR.G.Takwale & P.S.Puranik*(TataMcGraw-HillPublishingCompanyLtd.)	1	15

Unit-2	**Thermodynamics:** **Thermodynamics of Refrigerator:** Second Law of Thermodynamics (2.8),Carnot'sTheorem(2.9),ThermodynamicabsoluteScaleoftemperature(2.10),ThermodynamicsofRefrigeration (4.2) **Entropy:**IntroductionofEntropy (2.13),ChangeofEntropyinaReversibleProcess (2.14),changeofentropyinanIrreversibleprocess(2.15), Principle of Increase of Entropy of Degradation of Energy (2.16),FormulationoftheSecondlawintermofEntropy(2.17),Entropyandsecondlaw(2.18),ThirdlawofThermodynamics(Nernst'sHeat Theorem)(2.19)*(RelatedExamples&Problem)* **BasicReference:***ThermodynamicsandStatisticalPhysicsbyDr.J.P.AgarwalandSatyaPrakash(PragatiPrakashan)*	1	15
Unit-3	**WavesandSound:** **Wave:**TheoryofResonator(6.16),DependenceoftheFrequencyofresonator on the size and shape of the mouth (6.17), Velocity of Transversewavesalongastretchedstring(7.1),law'sofTransverseVibrationofStrings(7.3),Melde'sExperiment(7.5),Kundt'sTube(7.13)(*RelatedExamples&Problem)* **Ultrasonicwaves:**Ultrasonics (11.23),ProductionofUltrasonics(11.24),Magneto-StrictionEffect (11.24.2),Piezo-ElectricEffectMethod-Oscillator(11.24.3),Detectionof UltrasonicWaves(11.25),ApplicationsofUltrasonicwaves(11.27)(*RelatedExamples&Problem)* **BasicReference:***WavesAndOscillationsbyN.Subhramanyam&Brijlal (VikasPublshingHousePvt.Ltd,–2nd RevisedEdition.*	1	15
Unit-4	**Electronics:** **RectifierandPowerSupply:**TheHalfWaveRectifier(4.1)-[AverageorD.C.outputVoltage,AverageorD.C.outputcurrent,RMSvalueofoutputcurrent,Rectifierefficiency(RatioofRectification),Ripplefactor,VoltageRegulation,Peak inverse voltage(PIV),Transformer Utilization Factor(TUF)], TheFullWaveRectifier(4.2)-[AverageorD.C.outputcurrent,RMSvalueofoutputcurrent,,AverageorD.C.outputVoltage,Rectifierefficiency(RatioofRectification),Ripplefactor, VoltageRegulation,PeakInverseVoltage(PIV),TransformerUtilizationFactor(TUF)],ComparisonofHalfandFullWaveRectifiersCircuit(4.3),TheBridgeRectifier(4.4), **Filter Circuits:**The Half Wave Rectifier with Series InductorFilter(4.7.1)andwithcapacitor filter(4.7.2),TheFull WaveRectifierwithSeriesInductorFilter(4.7.3),ChokeInputFilteror L-section Filter(L-C Filter)(4.7.4), Capacitor Input Filter(C-L-C Filter or π-Filter),[Comparison of L and π-section filtercircuits] **BasicReference:***HandbookofElectronicsbyGuptaandKumar*	1	15

	: Further Reading – Other References : 1) MathematicalMethodinphysicalsciencesbyM.L.Boas(johnWilley&Sons) 2) MathematicalPhysicsbyBDGupta(4th Edition) 3)MathematicalPhysicsbyH KDas 4) VectoranalysisbyProf.RNDesaiUni.GranthNirmanBoard,Gujarat 5) HeatandThermodynamicsbyZeemansky 6) UniversityPhysicsbySears,Zeemankkyandyoung(NarosaPublishingHouse) 7) HeatandThermodynamicsbyRichardH.Dittmon&MarkW.Zemansky(TMH) 8) HeatandThermodynamicsbyA.B.GuptaandH.P.Roy(NewCentralBook) 9) ElectronicDevice&CircuitsbyAllenMottershead,(PHIPvt.LTD) 10) ElectronicsandRadioEngineeringbyM.L.Gupta. 11) BasicElectronisandLinearcircuitsbyBhargvaKulshreshth&GuptaTMHEdition **12)** ElementsofElectronicsbyBagde&Singh

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN
B.Sc.PHYSICS-SEMESTER–I
TYPEOFCOURSE:MINOR DISCIPLINE SPECIFIC COURSE

PROGRAMMECODE:SCIUG101 **COURSECODE:SC23MIDSCPHY102**

COURSENAME:Mathematical Physics and Heat-Thermodynamics

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02 Teaching Hours per Semester: 30	Theory	ExternalMarks-25 InternalMarks-25

CourseObjective:

- ToUnderstandtheconceptsandsignificanceofScalarandVectorFields,operationswithoperator∇andGauss'sTheorem,Stoke'sTheorem
- ToUnderstandtheapplicationsoflawsofThermodynamics&theconceptsofentropy.
- ToteachhowtocalculatechangesinvariousThermodynamicprocesses.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Understands the concepts and significance of Scalar and Vector Fields as well as operations of operator ∇,Gauss'sTheoremandStoke'sTheorem.
- UnderstandstheThermodynamics,Carnot'stheoremandconceptsofentropy.
- CalculatechangesinvariousThermodynamicprocesses.

Syllabus

Unit No.	Content	Credit	Lect.Hrs60
Unit-1	**MathematicalPhysics:** **VectorAlgebraandVectorAnalysis:**Dyadic(1.10),ScalarTripleproduct(1.11),Reciprocalvectors(1.12),VectorTripleproduct(1.13),PseudovectorsandPseudoScalars(1.16), SomeImportant DefinitionaboutVectors,Integrationofvector:LineIntegration,SurfaceIntegrationandVolume Integration(2.3a,b), Partial differentiation(2.4), Gradient of a scalarpoint function(2.5), Divergence of vector(2.6), Curl of a vector(2.8), MoreabouttheVectordifferentialOperator*A*(2.9),MultipleDelOperations(2.11),Someusefulidentities(2.13),Gauss'Theorem(2.14),StokesTheorem(2.17).(*RelatedExamples&Problems*) **BasicReference:***IntroductiontoClassicalMechanicsbyR.G.Takwale & P.S.Puranik*(TataMcGraw-HillPublishingCompanyLtd.)	1	15

Unit-2	**Thermodynamics:** **Thermodynamics of Refrigerator:** Second Law of Thermodynamics (2.8),Carnot'sTheorem(2.9),ThermodynamicabsoluteScaleoftemperature(2.10),ThermodynamicsofRefrigeration (4.2) **Entropy:**IntroductionofEntropy (2.13),ChangeofEntropyinaReversibleProcess (2.14),changeofentropyinanIrreversibleprocess(2.15), Principle of Increase of Entropy of Degradation of Energy (2.16),FormulationoftheSecondlawintermofEntropy(2.17),Entropyandsecondlaw(2.18),ThirdlawofThermodynamics(Nernst'sHeat Theorem)(2.19)*(RelatedExamples&Problem)* **BasicReference:***ThermodynamicsandStatisticalPhysicsbyDr.J.P.AgarwalandSatyaPrakash(PragatiPrakashan)*	1	15
	: Further Reading – Other References : 3) MathematicalMethodinphysicalsciencesbyM.L.Boas(johnWilley&Sons) 4) MathematicalPhysicsbyBDGupta(4th Edition) 3)MathematicalPhysicsbyH KDas 5) VectoranalysisbyProf.RNDesaiUni.GranthNirmanBoard,Gujarat 5) HeatandThermodynamicsbyZeemansky 6) UniversityPhysicsbySears,Zeemankkyandyoung(NarosaPublishingHouse) 7) HeatandThermodynamicsbyRichardH.Dittmon&MarkW.Zemansky(TMH) 8) HeatandThermodynamicsbyA.B.GuptaandH.P.Roy(NewCentralBook)		

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–I

TYPEOFCOURSE:INTER/MULTIDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 **COURSECODE:SC23MDSCPHY103**

COURSENAME: Waves-Sound and Electronics

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:2 TeachingHoursperSemester: 30	Theory	ExternalMarks-25 InternalMarks-25

CourseObjective:

- Todevelopknowledgeabouttheoryofresonatoranditsapplication,ultrasonicwaves,its production and application
- Todevelpoeknowledgeabout basic concepts, working of various rectifier and Filter circuits.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- LearnsaboutUltrasonics, productionanditsapplications.
- WillGetsufficientknowledgeofsoundandtheoryofresonator.
- Learns sufficient knowledge of various rectifier, Filter circuits and applications of them

Unit-1	**WavesandSound:** **Wave:**TheoryofResonator(6.16),DependenceoftheFrequencyofresonator on the size and shape of the mouth (6.17), Velocity of Transversewavesalongastretchedstring(7.1),law'sofTransverseVibrationofStrings(7.3),Melde'sExperiment (7.5),Kundt'sTube(7.13)(*RelatedExamples&Problem)* **Ultrasonicwaves:**Ultrasonics (11.23),ProductionofUltrasonics(11.24),Magneto-StrictionEffect (11.24.2),Piezo-ElectricEffectMethod-Oscillator(11.24.3),Detectionof UltrasonicWaves(11.25),ApplicationsofUltrasonicwaves(11.27)(*RelatedExamples&Problem)* **BasicReference:***WavesAndOscillationsbyN.Subhramanyam&Brijlal (VikasPublshingHousePvt.Ltd,–2nd RevisedEdition.*	1	15

Unit-2	**Electronics:** **RectifierandPowerSupply:**TheHalfWaveRectifier(4.1)-[AverageorD.C.outputVoltage,AverageorD.C.outputcurrent,RMSvalueofoutputcurrent,Rectifierefficiency(RatioofRectification),Ripplefactor,VoltageRegulation,Peak inverse voltage(PIV),Transformer Utilization Factor(TUF)], TheFullWaveRectifier(4.2)-[AverageorD.C.outputcurrent,RMSvalueofoutputcurrent, AverageorD.C.outputVoltage,Rectifierefficiency(RatioofRectification), Ripplefactor,VoltageRegulation,PeakInverseVoltage(PIV),Transformer UtilizationFactor(TUF)],ComparisonofHalfandFullWaveRectifiersCircuit(4.3),***TheBridgeRectifier***(4.4), **Filter Circuits:** The Half Wave Rectifier with Series InductorFilter(4.7.1)andwithcapacitor filter(4.7.2),TheFull WaveRectifierwithSeriesInductorFilter(4.7.3),ChokeInputFilteror L-section Filter(L-C Filter)(4.7.4), Capacitor Input Filter(C-L-C Filter or π-Filter),[Comparison of L and π-section filtercircuits] **BasicReference:***HandbookofElectronicsbyGuptaandKumar*	1	15

: Further Reading – Other References :

- UniversityPhysicsbySears,Zeemansky andYoung(NorosaPublishingHouse)
- ATextBookOnOscillations,WaveandAcousticsbyM.Ghosh&D.Bhattacharya(S.Chand Co)
- Vibration, Waves & Heat by Sears and Zeemansky
- ElectronicDevice&CircuitsbyAllenMottershead,(PHIPvt.LTD)
- ElectronicsandRadioEngineeringbyM.L.Gupta.
- BasicElectronisandLinearcircuitsbyBhargvaKulshreshth&GuptaTMHEdition
- ElementsofElectronicsbyBagde&Singh

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER –I (PRACTICALCOURSE)

PROGRAMMECODE:SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
MajorDisciplineCoreCourse(MJDSCP)	2 (Group A)	SC23MJDSC P PHY101(A)
MajorDisciplineCoreCourse(MJDSCP)	2 (Group B)	SC23MJDSC P PHY101(B)
MinorDisciplineCoreCourse(MIDSCP)	2	SC23MIDSC P PHY102
Inter-DisciplineCoreCourse(MDCP)	2	SC23MDSC P PHY103

TeachingHours

TeachingHoursperWeek:08 Hours for 4 Credit practical (120 Hours per Semester)
TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)

CourseObjectives:

- Togainpracticalknowledgebyapplyingtheexperimentalmethodtocorrelatewiththe Physicstheory.
- Toprovidehandsonexperiencewithequipmentsuchas,spectrometer,Pendulum,Flywheelandelectroniccircuits.
- Tolearntheusageofelectricalandopticalsystemsofvariousmeasurements.
- Toimpartpracticalknowledgebyperformingexperimentsbasedontheprinciplesoftheorycourses.
- Toprovidetraininghow toanalyzetheexperimentaldataandgraphicalanalysis.
- Todevelopintellectualcommunicationskillsanddiscussthebasicprinciplesofscientificconceptsinthegroup.

ABORATORY

EXPERIMENTS
FOR MAJOR COURSE 2 Credit for Group A
COURSECODE: SC23MJDSC P PHY101(A)

1. Determine aDampingcoefficient,Relaxationandqualityfactorinthedampedmotionofa simplePendulum.
2. StudyofResonator:Verificationofrelation$n^2(V+kv)$=constantanddeterminethe frequencyofunknownfork.
3. Determinationof angular acceleration (α) and find MI ofaFlywheel using plot α verses Tourqe
4. ArrangementofSpectrometerforparallelraysusingSchustermethod and to find Angle of Prizm
5. Calibrationofthe Spectrometeranddeterminesthewavelengthofunknownlineof Hg-spectrum.
6. To Find Refractiveindexofliquidusingconvexlens.
7. Analysisoferror.
8. VerificationofStefanBoltzmann'sfourthpowerlawusingA.C./D.C.Source
9. Melde's Experiment: (i) To prove P/L constant and (ii) P^2Tconstant
10. Least square Method
11. Study of Travelling Microscope, To determine Gauz eliment, Diameter of tube, width of auxiliary slit
12. To find the Young's Modulus of the material of a Rectangular Bar by Bending. (Y by cantilever)

LABORATORY EXPERIMENTS
For
MAJOR COURSE (2 Credit for Group B)
COURSECODE: SC23MJDSC P PHY101(B)

1. V-IcharacteristicsofZenerdiode
2. Study of Zener Diode as a voltage Regulator.
3. StudyoftheSeriesResonancewithFrequencyVariation. (**C** constant)
4. Determinationofthecapacitance'C'ofacondenser.
5. P-NJunctiondiodeasHalfWaveRectifierWithoutfilter. CalculationofPercentageofRegulation.
6. P-NJunctiondiodeasHalf WaveRectifier(i) WithSeriesInductorFilter
   (ii)WithShuntCapacitorFilter.CalculationofPercentageofRegulation.
7. VerificationofThevenin'sTheorem.
8. StudyofLogicGates:AND,ORandNOT. Verification of Truth table and giving understanding of voltage level for "0" and "1" level.
9. ExperimentalMeasurementsofPowerSupply,Resistor,Diode,Transistorby Multimeter
10. Study of Step Up Transformer. To determine Turn Ratio, % of Efficiency, Energy loss due to copper loss for a given transformer.
11. Study of Bridge Rectifier(i)Withoutfilter(ii)WithSeriesInductorFilter
    (iii)WithShuntCapacitorFilter.CalculationofPercentageofRegulation.
12. Study of Maximum Power transfer Theorem

CourseOutcome:LearningOutcomes

Bytheendofthecourse,thestudentswillbeabletounderstand.

- ThebasicprinciplesofPhysicsrelatedtotheircoursesinthepracticalway.
- Theoperationaldetailsofspectrometer,electroniccircuitsetc.
- Theexperimentaldesign aspectstodeterminevariouspropertiesoflikegravity,qualifactor, Refractiveindex,determinationofCauchy'sConstants,analysisofspectra,Analysisof error,determinevalueofunknownfrequencyetc.
- Theprocesstoanalyzetheobservationsandinfertheoutcomeoftheexperiments.
- Howtoanalyzetheexperimentaldataandgraphicalanalysis.

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER –I (PRACTICALCOURSE)

PROGRAMMECODE: SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
MinorDisciplineCoreCourse(MIDSCP)	2	SC23MIDSC P PHY102

TeachingHoursperWeek:04 Hours for 2 Credit practical and TeachingHoursperSemester: 60 Hours

Minor Discipline Core Course(MIDSCP) Practical

1. Melde's Experiment: (i) To prove P/L constant and (ii) P^2Tconstant
2. StudyofResonator:Verificationofrelationn^2(V+kv)=constantanddeterminethe frequencyofunknownfork.
3. Determinationof angular acceleration (α) and find MI ofaFlywheel using plot α verses Torque.
4. Least square Method
5. ArrangementofSpectrometerforparallelraysusingSchustermethod
6. StudyoftheSeriesResonancewithFrequencyVariation, Fix Capacitor.
7. Determinationofthecapacitance'C'ofacondenser.
8. Study of Maximum Power transfer Theorem
9. Study of Step Up Transformer: To determine Turn Ratio, % of Efficiency, energy loss due to copper loss for a given transformer.
10. P-NJunctiondiodeasHalfWaveRectifierWithoutfilter. CalculationofPercentageofRegulation.
11. VerificationofThevenin'sTheorem.
12. Calibrationofthe Spectrometeranddeterminesthewavelengthofunknownlineof Hg-spectrum.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER –I (PRACTICALCOURSE)

PROGRAMMECODE:SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
Multidisciplinary CoreCourse(MDSCP)	2	SC23MIDSC P PHY103

TeachingHoursperWeek:04 Hours for 2 Credit practical and TeachingHoursperSemester: 60 Hours

Multi DisciplineCoreCourse(MIDSCP) Practical

1. Determine aDampingcoefficient,Relaxationandqualityfactorinthedampedmotionofa simplePendulum.
2. StudyofResonator:Verificationofrelation$n^2(V+kv)$=constantanddeterminethe frequencyofunknownfork.
3. Determinationof angular acceleration (α) and find MI ofaFlywheel using plot α verses Tourqe
4. To Find Refractiveindexofliquidusingconvexlens.
5. VerificationofStefanBoltzmann'sfourthpowerlawusingA.C./D.C.Source
6. Study of Travelling Microscope, To determine Gauz eliment, Diameter of tube, width of auxiliary slit
7. V-ICharacteristicsofZenerdiode and Determine Breakdown voltage
8. Study of Zener Diode as a voltage Regulator.
9. P-NJunctiondiodeasHalfWaveRectifier(i)Withoutfilter.CalculationofPercentageofRegulation.
10. P-NJunctiondiodeasFull WaveRectifier(i)WithSeriesInductorFilter (ii)WithShuntCapacitorFilter.CalculationofPercentageofRegulation
11. StudyofLogicGates:AND,ORandNOT. Verification of Truth table and giving understanding of voltage level for "0" and "1" level.
12. Study of Bridge RectifierWithoutfilter. CalculationofPercentageofRegulation.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

B.Sc.PHYSICS- SEMESTER–I

TYPE OF COURSE: SKILL ENHANCEMENT COURSE

PROGRAMME CODE: SCIUG101

COURSECODE:SC23SECPHY106

COURSENAME:INSTRUMENTATIONMEASUREMENTANDANALYSIS

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02 TeachingHoursperSemester: 30	Theory	ExternalMarks–25 InternalMarks-25

Course Objective:

- To understand the principles of various instruments and its application.
- To Learn the concepts Vernier calipers, Micrometer screw, spherometer, spectrometer etc.
- To Understands working function of Galvanometer and determine merit of figure.
- Learns about construction, working and use of various measuring instruments.

Course outcome:

At the end of the course students will able to

- Understand the basic knowledge of working of various instruments and its application.
- Learns the construction, working process and use of various measuring instruments.
- Will get sufficient knowledge of Galvanometer and determine various scientific parameters.

:: Syllabus ::

Unit No.	Content	Credit	Hrs 30
Unit-1	**Vernier Calipers:** Introduction, Theory, Figure, Description of theinstrument, Detail study of Least count, Errors, Positive error, negativeerror,Determinationofmagnitudeofpositiveandnegativeerrors. **MicrometerScrew:**Introduction,Theory,Figure,Description ofthe instrument, Definition of pitch and its determination, study of leastcount, Meaning of the error and explanation of positive and negativeerrors.Determinationofpositiveandnegativeerrors.Method oftaking observationwith thehelpofMicrometerScrew. **Spherometer:**Introduction,Theory,Figure,Descriptionoftheinstrument, To determine the pitch of the screw, To determine the leastcount of the spherometer, Zero error, Derivation of the formula for theradiusofcurvatureofacurvedsurface.	1	15

Unit-2	**WheatstoneBridge:**Introduction,Theory with figure, the figureofmeterbridgeusedinlaboratory,constructionofMeterbridge. Post-Office box: Introduction, Theory, Circuit Diagram, TheoreticalCircuitdiagram,explanationofworkingwithnecessaryformula. **Galvanometer:**Introduction,Theory,SensitivityandFigureofMeritofGalvanometer. **Spectrometer:**Introduction,Constructionandexplanationofthree main parts of Spectrometer,Mercury Discharge lamp,Sodium Dischargelamp,theadjustment,levelingandthemethodofrecordingtheobservationofSpectrometer.	1	15
Reference: BookforStudy:ExperimentalBookforPhysics			

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–I

TYPEOF COURSE:SKILL ENHANCEMENTCOURSE (SEC)

PROGRAMMECODE:SCIUG101 COURSECODE:SC23SECPHY106 (A)

COURSENAME:INTRODUCTIONTONANOTECHNOLOGY

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02T eachingHoursperSemester:30	Theory	ExternalMarks–25 InternalMarks-25

Sr. No	Contain	Credit	Lec. Hrs 30
Unit 1	**ConceptofNanotechnology:** Nanotechnology,NanotechGeneration,Nanoscience,Newformof Carbon,Nanocomposites,PolymerNanocomposites,Nanomaterials,Propertiesofnanomaterials-, One-, two- and three-dimensionalnanomaterials,Molecular nanotechnology,Nanostructuredmaterialsbyself-assembly,Nanocrystals,What nanodevicescan do inthemedicalfield? Nanopores,nanoionics,nano mechanics, Nanorobotics. **Tools to Make and measure a nano structure:** ToolsandTechniques,microscopy,Metrology,Simulation,Carbon Nanotube(CNT)–fabrication,PurificationofCNTs,Dispersion,ScanningProbeMicroscopes(SPM),AtomicForceMicroscopy(AFM),SingleMoleculeTechniques,MicrolithographyandMEMs,Electronbeamlithography andfocusedionbombardment	1	15
Unit 2	**ApplicationsofNanotechnology:** Identifiedpotentialapplications Expectedbenefitsfromnanotechnologies,cannanotechnologyhelpinaddressingvariouschallenges,Energy andEnergyEfficiency,newenergyproducers,Medicine,security,OtherApplications,Constructions. **Impactof Nanotechnology:** Societalimpactofnanotechnology,Socialandethicalimpact,Health andenvironmentalimpact,Risks withnanotechnology,IndianScenarioinnanotechnology	1	15
Reference Book: Nanotechnology:technologyRevolutionof21stCenturyRakeshRathi(S.Chand&Company,NewDelhi)			
Further Reading: IntroductiontoNanoscience,S.M.Lindsay(OxfordPress)Nano:TheEssentials, T.Pradeep(TataMcGrawHill)			

PROGRAM CODE : SCIUG102

Syllabus and Scheme of Examination

for

Sem. I and Sem. II of B.Sc. Honors Chemistry

Four-year Graduate Honors Program in Chemistry
Under NEP 2020

Submitted

to

Hemchandracharya North Gujarat University, Patan

Under

Choice Based Credit System

Implemented w.e. f June, 2023

Submitted on May, 2023
ReSubmitted on July, 2023
Resubmitted on August, 2023

PREAMBLE

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters.

The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. However, due to lot of diversity in the system of higher education, there are multiple approaches followed by universities towards examination, evaluation and grading system. While the HEIs must have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching–learning methods, there is a need to devise a sensible system for awarding the grades based on the performance of students.

The National Education Policy (NEP) 2020 (hereafter referred to as NEP or Policy) recognizes that higher education plays an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. It notes that "given the 21st -century requirements, quality higher education must aim to develop good, thoughtful, well-rounded, and creative individuals". In accordance with the NEP 2020, the UGC has formulated a new student-centric "Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)" incorporating a flexible choice-based credit system, multidisciplinary approach, and multiple entry and exit options. This will facilitate students to pursue their career path by choosing the subject/field of their interest. The grading system is considered to be better than the conventional marks system and hence it has been followed in the top institutions in India and abroad. So it is desirable to introduce uniform grading system. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students. To bring in the desired uniformity, in grading system and method for computing the cumulative grade point average (CGPA) based on the performance of students in the examinations, the UGC has formulated these guidelines.

CHOICE BASED CREDIT SYSTEM (CBCS):

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill-based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

OUTLINE OF CHOICE BASED CREDIT SYSTEM

1. **Major Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Major Discipline specific course.
2. **Minor discipline** helps a student to gain a broader understanding beyond the major discipline.
3. **Multidisciplinary Course (MDC):**Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
4. **Interdisciplinary Course (IDC) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).
5. **Ability Enhancement Courses (AEC):** Environmental Science, English Communication/MIL Communicationare mandatory for all disciplines.
6. **Skill Enhancement Courses (SEC):**These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based instruction.
7. **Value Added Courses (SEC):**These courses may be chosen from a pool of courses designed to provide value-based educationicoursesnstruction.

The Proposed new courses in chemistry for undergraduate classes are reassigned in accordance to semester/CBCS/Grading system with new education policy. The new course is based on model curriculum of the university grants commission.

COURSES/ACTIVITIES UNDER THE PROGRAM

1. **Lecture courses**: Courses involving lectures relating to a field or discipline by an expert or qualified personnel in a field of learning, work/vocation, or professional practice.
2. **Tutorial courses:** Courses involving problem-solving and discussions relating to a field or discipline under the guidance of qualified personnel in a field of learning, work/vocation, or professional practice.
3. **Practicum or Laboratory work:** A course requiring students to participate in a project or practical or lab activity that applies previously learned/studied principles/theory related to the chosen field of learning, work/vocation, or professional practice under the supervision of an expert or qualified individual in the field of learning, work/vocation or professional practice
4. **Seminar:** A course requiring students to participate in structured discussion/conversation or debate focused on assigned tasks/readings, current or historical events, or shared experiences guided or led by an expert or qualified personnel in a field of learning,

work/vocation, or professional practice.

5. **Internship:** A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations. Internships involve working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning.
6. **Studio activities:** Studio activities involve the engagement of students in creative or artistic activities. Every student is engaged in performing a creative activity to obtain a specific outcome. Studio-based activities involve visual- or aestheticfocused experiential work.
7. **Field practice/projects:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity.
8. **Community engagement and service:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity. The curricular component of 'community engagement and service' will involve activities that would expose students to the socio-economic issues in society so that the theoretical learning's can be supplemented by actual life experiences to generate solutions to real-life problems.

Objectives of Program

1. Recognizing, identifying, and fostering the unique capabilities of each student to promote her/his holistic development.
2. To meet the growing demand of specialization and advanced courses in applied science.
3. To redesign the courses the special emphasis on local requirements, environment, to link the courses with requirements of the industries and research.
4. Flexibility for learners to move from one institution to another to enable them to have multi and/or interdisciplinary learning.
5. Flexibility to switch to alternative modes of learning (offline, ODL, and Online learning, and hybrid modes of learning)
6. To prepare students for National level entrance test like NET/SLET/JRF and other competitive exams.

General Information and Rules for Semester I to VIII
B.Sc. Honors (Chemistry) with Research or Without Research

1. The medium of instruction will be English or/ & Gujarati, question papers will be set in English and Gujarati but answers in examinations will either in English or Gujarati.
2. Passing standard: As per the revised rules and regulations of Hemchandracharya North Gujarat University, Patan.
3. Viva voce will be part practical examination and it will be pertaining to theory as well as practicals studied during end semester examination.
3. The Certificate will be awarded in major course i.e. chemistry after completion of 01 Year with 44 credits and successful completion of 04 credit vocational course during summer vacation of first year if he/she want to exit the course.
4. The Diploma will be awarded in the in major course i.e. in chemistry after completion of 02 Years with 88 credits and successful completion of 04 credit vocational course during summer vacation of second year if he/she want to exit the course..
5. The B. Sc. degree will be awarded in the in major course i.e. in chemistry after completion of 03 Years with 132 credits.
6. The B. Sc. degree with honors with research or without research will be awarded in the in major course i.e. chemistry after completion of 04 Years with 176 credits with research or without research.
7. The college/ Department will run B. Sc. Honors course with honors or without research or both with prior permission of university.
8. Each student is required to complete all theory papers and practicals as specified in each semester. These will include Major Discipline specific course (MJDSC), Minor Discipline specific course (MIDSC), Multidisciplinary/ Inter disciplinary course (MDC/ IDC), Ability enhancement course (AEC), Value added course (VAC), skill enhancement courses (SEC) and practical's.
9. The choice for paper in Minor Discipline specific course (MIDSC), Multidisciplinary/ Inter disciplinary course (MDC/ IDC), Value added course (VAC), skill enhancement courses (SEC) is left to the student.
10. There will be weightage for continuous comprehensive evaluation (CCE) and & weightage to semester End examination (SEE) in Major Discipline specific course (MJDSC), Minor Discipline specific course (MIDSC), Multidisciplinary/ Inter disciplinary course (MDC/ IDC), Ability enhancement course (AEC), Value added course (VAC), skill enhancement courses (SEC) and practical's.

    The CCE for each semester shall done as per the continuous evaluation process. For 50 marks following activities are to be performed.

    I. Activity for continuous comprehensive evaluation Marks (out of 50)

    (Major Theory)

(a)	Test of theory(Minimum 05)	25
(b)	Assignment/ Quiz	10
(c)	Group Discussion/ Seminar	05
(d)	Problem solving	05
(e)	Attendance	05

II. Activity for continuous comprehensive evaluation (Minor/ Skill/Multi/ Interdisciplinary Theory)	Marks (out of 25)
(a) Test of theory(Minimum 03)	15
(b) Group Discussion/ Seminar	05
(c) Attendance	05
III. Activity for continuous comprehensive evaluation (Major Practical's)	Marks (out of 50)
(a) Internal practical exam Group A	15
(b) Internal practical exam Group B	15
(b) Journal/ Practical Report(Certified)	10
(c) Viva voce	10
IV. Activity for continuous comprehensive evaluation (Minor/ Multi/ Interdisciplinary Practical's)	Marks (out of 25)
(a) Internal practical exam	15
(b) Journal/ Practical Report(Certified)	05
(c) Viva voce	05

11. There shall be coverage of maximum 30% syllabus through online mode of teaching. As per directives of UGC.
12. Students should be encouraged to use electronic media to complete the course.
13. For each semester in Ist year, there will be 550 marks per semester and for completion of certificate course at the time of exit, the total marks will be given out of 1200 (1100+100). The cumulative grade will be given as per university rules.
14. **Note:** During the preparation of this curriculum, ample care is taken for consideration of the followings:
    (a) NEP 2020
    (b) Model curriculum of U.G.C.
    (c) National Credit Frame work Repot of UGC, 2023
    (d) Concept of continuous evaluation
    (e) CGPA (Cumulative Grade Point Average Credit)
    (f) CBCS (Choice Based Credit System)
    (g) Semester approach
    (h) Revised rules and regulation of Hemchandracharya North Gujarat University, Patan.
    (i) KCG Standard Operating Procedure, August 2023
15. For internal remuneration, four hours of Practical's should be considered equivalent to two hours of theory.
16. Minimum 15 students should be in one batch for practical's and external/ internal exam

Semester	Type Of Course Opted	Course Name	Course Code	Credits	Examination			Total Marks
					Internal	External	Examination Hours	
I	Major Discipline Specific course MJDSC-	Fundamentals of Chemistry- I	SC23MJDSCCHE101	4	50	50	2.30	100
	Minor Discipline Specific course MIDSC	To be Selected – I Basic chemistry -1	SC23MIDSCCHE102	2	25	25	2.00	50
	Multi/Inter disciplinary Course MDC/IDC	To be Selected (General chemistry-I/ Agricultural chemistry)	SC23MDCCHE103/ SC23MDCCHE103A	2	25	25	2.00	50
	Ability Enhancement Courses AEC	To be Selected (From languages)	SC23AECCHE104	2	25	25	2.00	50
	Value Added course VAC	To be Selected (pollution and environment protection law)	SC23VACCHE105	2	25	25	2.00	50
	Skill Enhancement Course SEC	To be selected SEC-I Analytical chemistry-1 or SEC-2 Soil analysis or SEC -3 Laboratory	SC23SECCHE106/ SC23SECCHE106A/ SC23SECCHE106B	2	25	25	2.00	50
	Practicals Major Discipline Specific course MJDSC Practicals Minor Discipline Specific course MIDSC Practicals Multi/Inter Disciplinary Course MDC/IDC	PMJDC Practical -I Lab Group A & Group B PMIDC Practical-II Lab PMDC/PIDC Practical-1II Lab	SC23PMJDSCCHE101 SC23PMIDSCCHE102 SC23PMDCCHE103	4 2 2	50 25 25	50 25 25	8 4 4	100 50 50
	Total Credits of Semester - I			22	275	275		550

A. Common Formula for Setting Question Papers for Major Discipline Specific course

Time: 2.30 Hours Total Marks: 50

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	13 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	12 Marks
Que. No: 3	Write any Two out of Three Questions	Unit III	13 Marks
Que. No: 4	Write any Two out of Three Questions	Unit IV	12 Marks

B. Common Formula for Setting Question Papers for Minor/ Multi/Inter disciplinary Courses

Time: 2.00 Hours Total Marks: 25

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	08 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	08 Marks
Que. No: 3	Write any three Small relevant Questions	Unit I, II	09 Marks

C. Common Formula for Setting Question Papers for Value added/ Skill Enhancement Courses

Time: 2.00 Hours Total Marks: 25

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	08 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	08 Marks
Que. No: 3	Write any three Small relevant Questions	Unit I, II	09 Marks

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name : B. Sc. Chemistry Semester : I
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MJDSCCHE101

Type of course : Major Discipline Specific course
Name of course : Fundamentals of chemistry I
Total Marks : 100

Effective from June 2023 Under NEP 2020

Total Credits : 04 Teaching Hours per Week: 04 Teaching Hours per Semester: 60		Theory	External 50 Marks Internal 50 Marks

Course Objectives:

1. To understand the core concepts of valence bond theories.
2. To understand organic chemistry i.e. resonance, hyperconjugation, inductive effect etc. and their application.
3. To study about the chemical kinetics and types of reactions.
4. To know about the Volumetric titrations and calculations for estimation.

Course Outcome:

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.
2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
4. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
5. To know about the Volumetric titrations and calculations for estimation.

Unit	Topic	Credit	Hr
1	**CHEMICAL BONDING** **(A) Valence Bond Theory:**Introduction; Hitler-London theory (energy changes taking place during the formation of H_2 Molecule, Pauling-Slater's Theory (orbital Overlap theory of Covalent Bond). Types of Bond, Covent bond, ionic bond, Coordination covalent bond Coordination bond and Wanderwals force bond. Hybridization and types of hybridization. SP, Sp^2, Sp^3, dsp^2,sp^3d, sp^3d^2 **(B) Molecular Orbital Theory:** Introduction. M.O. Treatment for H_2 molecules Bonding molecular orbitals and Anti-boding molecular orbitals, Sigma and Pi Molecular orbitals. Formation and configuration of Molecular orbital in a Homo-nuclear diatomic species of A_2 type (H_2; H_2^+; N_2 ;N_2^+ ;O_2 ;O_2^+; O_2^{-2}) Formation and configuration of Molecular orbiral in a Hetero-nuclear diatomic species of AB type (CO; CN; CN^-; NO; NO^-)	1	15
2	**(A) Structure And Properties** Factors affecting to the properties of organic molecule: Intramolecular forces (dipole-dipole interaction, vander waals forces), Electromeric effect, Inductive effect, Resonance effect(draw resonating structures of Nitro benzene, Chlorobenzene, Phenoxide ion, Anillinium ion, Acetate ion), Hyper conjugation (O,P-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals) **(B) Reaction Mechanism** Fission of Covalent bond (With at least one example of each intermediates), Types of reagents.: Nucleophile, electrophile, Free Radical, Types of organic reaction with mechanism, Substitution reactions Nucleophilic & Electrophilic), Elimination reactions (E1& E2), Addition reactions (Nucleophilic & Electrophilic)	1	15
3	**Chemical Kinetics.** Introduction : Rate of reaction, Order of reaction, Molecularity, Rate equation for zeroth order reaction, Rate equation for first order reaction, Characteristics of first order reaction, Rate equation for	1	15

	second order reaction.(a = b) & (a≠b); Characteristics of second order reaction, Rate equation for third order reaction (a = b = c) ; Characteristics of third order reaction, Consecutive reaction, Parallel reaction, Reversible reaction, Numerical.		
4.	**Analytical Chemistry** Introduction to Analytical Chemistry : Classification of Classical and Electro analytical Techniques, Literature of Analytical Chemistry (Names of Author and Publishers for Any Ten Books, Journals and Reviews), Criterion for Selection of analytical Techniques, Define: Accuracy, Precision, Specification, Detection limit, Characterization limit, Linearity, Range, Robustness, etc.Analytical Data Treatment: Error, Types of errors, Accuracy and Precision. Statistical Terms: Mode, Average, Median, Deviation, Average Deviation, Relative Average Deviation, Standard Deviation & Coefficient of variance. Q-Test for the rejection of result and related numerical, Significant figures, 2.5 d and 4.0 d rules.	1	15

Books Recommended:

Inorganic Chemistry

1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.

3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.

4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

Physical Chemistry

1. Advance Physical Chemistry by Gurdeep raj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.

Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5^{th} edn.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4^{th} edn, Himalaya Publication House.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5^{th} edn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. ChemPMJDSCistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMJDSCCHE101

Type of Course : Practicals Major Discipline Specific Course PMJDSC
Name of Course : Practical's for Fundamentals of chemistry I
Total Marks : 100

Effective from June 2023 Under NEP 2020

GROUP A

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 12	Practicals	External 25 Marks Internal 25 Marks

GROUP B

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 08	Practicals	External 25 Marks Internal 25 Marks

Course Objectives: 1. To identify the organic components. 2. Preparation of solutions and their standardization.
Course Outcomes: 1. Students will gain a comprehensive knowledge and skills in standardization and preparation of solutions for carrying out reactions. 2. To understand basic methods to identify the compounds on the basis of M. Pt or b. Pt.

Sr.No.	List of Practicals	Credit	Hr
GROUP A	**Organic Chemistry (Any twelve)** 1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point. Preparation of suitable derivative. 2) Candidate should perform the analysis of at least 06 compounds. List of compounds **Acids**: Benzoic acid. Cinnainic acid, Phthalic acid.Oxalic	2	60

	acid.Succinic acid. **Phenols**: α-Napthol. β-Naphthol. **Bases**: *p*-Toludine, Diphenylamine. Aniline.Methyl aniline. **Neutrals:** Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene. Acetone, Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
GROUP B	**Standardization (Any Eight)** 1. Identify laboratory glassware and equipments. 2. Calibration of burette, Pipette and measuring flasks. 3. Preparation of standard stock solution of HCI by v/v method and their different dilutions. 4. Preparation of standard solution of succinic acid and standardization of NaOH 5. Preparation of standard solution of oxalic acid and standardization of KOH 6. Preparation of standard solution of $Na_2S_2O_3$ and standardization of I_2 solution. 7. Preparation of standard solution of EDTA and estimation of Ca^{+2} in $CaCl_2$ solution. 8. Preparation of standard solution of EDTA and estimation of Mg^{+2} in $MgCl_2$ solution. 9. Preparation of standard solution of Oxalic acid and standardization of $KMnO_4$ solution. 10. Preparation of standard solution of $K_2Cr_2O_7$ and standardization of $FeSO_4$ solution. 11. Preparation of standard stock (i.e. 0.1 N NaOH solutions by w / v method and their different dilutions.	2	60
Books Recommended: 1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By			

Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MIDSCCHE102

Type of course : Minor Elective course MIDSC
Name of course : Fundamentals of chemistry I
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 02 Teaching Hours per Semester: 30	Theory	External 25 Marks Internal 25 Marks	

Course Objectives:

1. To understand the core concepts of valence bond theories.
2. To understand organic chemistry i.e. resonance, hyperconjugation, inductive effect etc. and their application.

Course Outcome:

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.
2. Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
3. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

Unit	Topic	Credit	Hr
1	**CHEMICAL BONDING** **(A) Valence Bond Theory:** Introduction; Hitler-London theory (energy changes taking place during the formation of H_2 Molecule, Pauling-Slater's Theory (orbital Overlap theory of Covalent Bond). Types of Bond, Covent bond, ionic bond, Coordination covalent bond Coordination bond and Wanderwals force bond. Hybridization and	1	15

	types of hybridization. SP, Sp^2, Sp^3, dsp^2,sp^3d, sp^3d^2 **(B) Molecular Orbital Theory:** Introduction. M.O. Treatment for H_2 molecules Bonding molecular orbitals and Anti-boding molecular orbitals, Sigma and Pi Molecular orbitals. Formation and configuration of Molecular orbital in a Homo-nuclear diatomic species of A_2 type (H_2; H_2^+; N_2 ;N_2^+ ;O_2 ;O_2^+; O_2^{-2}) Formation and configuration of Molecular orbiral in a Hetero-nuclear diatomic species of AB type (CO; CN; CN^-; NO; NO^-)		
2	**(A) Structure And Properties** Factors affecting to the properties of organic molecule: Intramolecular forces (dipole-dipole interaction, vander waals forces), Electromeric effect, Inductive effect, Resonance effect(draw resonating structures of Nitro benzene, Chlorobenzene, Phenoxide ion, Anillinium ion, Acetate ion), Hyper conjugation (O,P-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals) **(B) Reaction Mechanism** Fission of Covalent bond (With at least one example of each intermediates), Types of reagents.: Nucleophile, electrophile, Free Radical, Types of organic reaction with mechanism, Substitution reactions Nucleophilic & Electrophilic), Elimination reactions (E1& E2), Addition reactions (Nucleophilic & Electrophilic)	1	15

Books Recommended:

Inorganic Chemistry

1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.

3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.

4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.

2. Text book of Organic Chemistry, ArunBahal, S.Chand.

3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.

4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.

5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.

6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.

7. Physical Chemistry by P.W.Atkins. 5^{th} edn.Oxferd 1994 7thedn-2002.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMIDSCCHE102

Type of Course : Practicals Minor (Elective) Discipline Specific Course PMIDSC
Name of Course : Practical's for Fundamentals of chemistry I
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To identify the organic components.
2. Preparation of solutions and their standardization.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in standardization and preparation of solutions for carrying out reactions.
2. To understand basic methods to identify the compounds on the basis of M. Pt or b. Pt.

Sr.No.	List of Practicals	Credit	Hr
1	**Organic Chemistry (Any six)** 1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point. Preparation of suitable derivative. 2) Candidate should perform the analysis of at least 06 compounds. List of compounds **Acids**: Benzoic acid. Cinnainic acid, Phthalic acid.Oxalic acid.Succinic acid. **Phenols**: α-Napthol. β-Naphthol. **Bases**: *p*-Toludine, Diphenylamine. Aniline.Methyl aniline. **Neutrals:** Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene. Acetone,	1	30

	Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
2	**Standardization** : **(Any Four)** **1**. Preparation of standard solution of succinic acid and standardization of NaOH / KOH 2. Preparation of standard solution of Na_2S2O_3 and standardization of I_2 solution. 3 .Preparation of standard solution of EDTA and estimation of Ca^{+2} / Mg^{+2} in $CaCl_2$ / $MgCl_2$ solution. 4. Preparation of standard solution of Oxalic acid and standardization of $KMnO_4$ solution. 5. Preparation of standard solution of $K_2Cr_2O_7$ and standardization of $FeSO_4$ solution. 6. Preparation of standard stock (i.e. 0.1 N NaOH solution by w / v method and their different dilutions. 7. Preparation of standard stock solution of HCI by v/v method and their different dilutions.	1	30

Books Recommended:

1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE103

Type of course : Multidisciplinary Course MDC
Name of course : General chemistry I
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. To study about the Chemical kinetics and types of reactions.
2. To know about the Volumetric titrations and calculations for estimation.

Course Outcomes:

1. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
4. Students will be able to function as a member of an interdisciplinary problem solving team.

Unit	Topic	Credit	Hr
1	**Chemical Kinetics.** Introduction : Rate of reaction, Order of reaction, Molecularity, Rate equation for zeroth order reaction, Rate equation for first order	1	15

	reaction, Characteristics of first order reaction, Rate equation for second order reaction.(a = b) & (a≠b); Characteristics of second order reaction, Rate equation for third order reaction (a = b = c) ; Characteristics of third order reaction, Consecutive reaction, Parallel reaction, Reversible reaction, Numerical.		
2	**Analytical Chemistry** Introduction to Analytical Chemistry : Classification of Classical and Electro analytical Techniques, Literature of Analytical Chemistry (Names of Author and Publishers for Any Ten Books, Journals and Reviews), Criterion for Selection of analytical Techniques, Define: Accuracy, Precision, Specification, Detection limit, Characterization limit, Linearity, Range, Robustness, etc.Analytical Data Treatment: Error, Types of errors, Accuracy and Precision. Statistical Terms: Mode, Average, Median, Deviation, Average Deviation, Relative Average Deviation, Standard Deviation & Coefficient of variance. Q-Test for the rejection of result and related numerical, Significant figures, 2.5 d and 4.0 d rules.	1	15

Books Recommended:

Physical Chemistry

1. Advance Physical Chemistry by Gurdeep raj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.

Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5thedn.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.

3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5^{th} edn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE103

Type of course : Practicals Multi Disciplinary Course PMDC
Name of course : Practical's for General chemistry I
Total Marks :50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester: 60 Minimum Number Practicals to be Performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To identify the organic components.
2. Preparation of solutions and their standardization.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in standardization and preparation of solutions for carrying out reactions.
2. To understand basic methods to identify the compounds on the basis of M. Pt or b. Pt.

Sr.No.	List of Practicals	Credit	Hr
1	**Organic Chemistry (Any six)** 1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point. Preparation of suitable derivative. 2) Candidate should perform the analysis of at least 06 compounds. List of compounds **Acids**: Benzoic acid. Cinnainic acid, Phthalic acid.Oxalic acid.Succinic acid. **Phenols**: α-Napthol. β-Naphthol. **Bases**: *p*-Toludine, Diphenylamine. Aniline.Methyl aniline. **Neutrals:** Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene. Acetone,	1	30

	Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
2	**Standardization (Any Four)** 1) Preparation of standard solution of succinic acid and standardization of NaOH / KOH 2) Preparation of standard solution of Na_2S2O_3 and standardization of I_2 solution. 3) Preparation of standard solution of EDTA and estimation of Ca^{+2} / Mg^{+2} in $CaCl_2$ / $MgCl_2$ solution. 4) Preparation of standard solution of Oxalic acid and standardization of $KMnO_4$ solution. 5) Preparation of standard solution of $K_2Cr_2O_7$ and standardization of $FeSO_4$ solution. 6) Preparation of standard stock (i.e. 0.1 N NaOH solution by w / v method and their different dilutions. 7) Preparation of standard stock solution of HCI by v/v method and their different dilutions.	1	30

Books Recommended:

1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE103A

Type of course : Multi Disciplinary Course MDC
Name of course : Agricultural Chemistry
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. To know about types of fertilizers
2. Major industrial suppliers of fertilizers
3. Need and importance of organic forming
4. To have Knowledge about Dry land agricultural forming.

Course Outcome:

1. Students will have a firm foundation in the fundamentals and application of current fertilizers.
2. Students will know about organic forming and its importance.
3. Status of dry land farming in India and its solution.

Unit	Topic	Credit	Hr
1	**Organic Farming** Introduction & history of organic farming, objective of organic farming, principle of organic farming, types of organic farming, techniques of organic farming, method of organic farming, difference between organic and Nonorganic farming, importance of organic farming, pros of organic farming, cons of organic farming, growth of organic farming, government initiative for organic farming, benefit: economical.	1	15

	Plant Nutrients, Major Nutrients, Minor Nutrients, Trace Nutrients		
2	**Reinforced & Dry land Agriculture:** Introduction & history of Reinforced & Dry land Agriculture, Problem & prospects of rainfed and& Dry land Agriculture in India, Soil and climatic conditions prevalent in dry land areas. Definition of Fertilizer, Classification of Fertilizer, Nano fertilizer, Super Phosphate, Tripal Super Phosphate. Mix Fertilizer. Droughts: Types, effect of water deficient on physio-morphological characteristics of plant. Crops management practices in dry land areas, Contingent crop planning for aberrant weather	1	15

Books Recommended:

1. Principle of Organic farming: S R Ready, As per ICAR Syllabus
2. Prakrutik Kheti (Gujarati Version) June 2020 By Shree Acharya Devrat, Dr. A. R. Pathak

Further Reading:

1. Industrial Chemistry by B. K. Sharma, Pragati Prakashan, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE103A

Type of course : Practicals Multi disciplinary Course PMDC
Name of course: Practical's for Agricultural chemistry
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To understand soil taxonomy.
2. To know about metrological properties of soil.
3. To provide information about essential elements in soil.
4. To understand about nanofertilizers.

Course Outcome:

1. Students will understand about quality of soil inour locality.
2. To know about preparation of organic fertilizers.
3. Interpretation of satellite data.

Sr.	List of Practicals	Credit	Hr
1	**(Any six)** 1. Classification of soils using soil taxonomy. 2. Identification and quantification of minerals in soil fractions 3. Analysis of plants for essential elements 4. Chemical analysis of soil for total and available nutrients. 5. Identification of fertilizers and nanofertilizers 6. Nutrient contents in nitrogenous, phosphatic and potassic fertilizers	1	15

	7. Decomposition of organic matter in soil		
2	**(Any Four)** 8. Aerial photo and satellite data interpretation for soil and land. 9. Morphological properties of soil profile in different landforms 10. Grouping soils using available data base in terms of soil quality. 11. Field Project - Preparation of Organic farming fertilizers 12. Field Project - Appling and studying Organic Farming fertilizers.	1	15

Books Recommended:

1. Indian Society of Soil Science. 2002.
2. Fundamentals of Soil Science. ISSS, New Delhi Kirkham, D. and Powers, W. L. 1972.
3. Lal, R. and Shukla, M. K. 2004. Principles of Soil Physics. Marcel Dekker

Further Reading:

4. Brady N. C. and Weil R. R. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
5. Principles Plant Nutrition. International Potash Institute, Switzerland.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23VACCHE105

Type of course : Value Added Course VAC
Name of course : Pollution laws and Environment Protection
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per semester:30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. To provide for prevention, control, and abatement of air pollution. To provide for the establishment of the boards at the central and state levels to implement the act.
2. To preserve and protect the nature's gifts from pollution.
3. To protect the man's fundamental rights of freedom
4. To enforce laws regarding the protection of environment in the regions.

Course Outcome:

1. Students willl understand that Equality and adequate conditions of life in an environment of quality that permits a life of dignity and wellbeing
2. To take strict actions against those who harm the environment
3. To safe guard better environment and better environment conditions..

Unit	Topic	Credit	Hr
1	**Introduction:** Environmental pollution, Types of pollution, Environment legislation, climate change in India ,Need for environment legislation, Purpose of environment legislation, Laws related to environment in India, Environment policies in India.	1	15
2	**Regulations:** The Noise Pollution (Regulation and Control)	1	15

	(Amendment) Rules, 2010, The Air (prevention and control of pollution) Act, 1981, The National Environment Appellate Authority Act, 1997, The Environment (Siting for Industrial Projects) Rules, 1999, The Ozone-Depleting Substances (Regulation And Control) Rules, 2000. Landmark cases on environment legislation in India 1. J.C. Galstaun v. DuniaLal Seal (1905) 2. M.C. Mehta & Another vs. Union of India & Others 3. Subhash Kumar v. State of Bihar (1991) 4.A global perspective on environment laws United Nations Conference on the Human Environment, Stockholm, 1972.		

Books Recommended:

1.Pollution Control Acts, Rules & Notifications Issued thereunder, Central Pollution Control Board (Ministry Of Environment, Forest & Climate Change, Government Of India) PariveshBhawan, East Arjun Nagar, Delhi – 110032 Website: Http://Www.Cpcb.Nic.In April, 2021.

2.Environmental Law In India, By P Leelakrishnan, 6th Edition 2021 By P Leelakrishnan**,** Publisher: Lexis Nexis.

3.Environmental Law and Policy in India,ShyamDiwan& Armin Rosencranz, Oxford University Press.

Further Reading:

1.Pollution Control Acts, Rules & Notifications Issued thereunder, Central Pollution Control Board (Ministry Of Environment, Forest & Climate Change, Government Of India) Parivesh Bhawan, East Arjun Nagar, Delhi – 110032 Website: Http://Www.Cpcb.Nic.In April, 2021.

2. Environmental Law and Policy in India,Shyam Diwan & Armin Rosencranz, Oxford University Press.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE106

Type of course : Skill Enhancement course SEC
Name of course : Analytical Chemistry-I
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 02 Teaching hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. To understand importance of taking precautions in Chemical laboratory
2. To have knowledge of lab apparatus
3. To know about primary and secondary laboratory reagents .

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in assessing laboratory reagents.
2. To understand the importance glass wares in chemical laboratories and in performing experiments.
3. Students will learn how to prepare chemical solutions needed in chemical laboratories.

Unit	Topic	Credit	Hr
1	**Lab Apparatus** (A) Glass apparatus Beaker, test tube, boiling tube, conical flask, filtration flask, round bottom flask, flat bottom flask, funnel, separating funnel, watch glass, measuring cylinder, petridish, desiccator, measuring cylinder, glass rod, glass tube. (B) Volumetric and Heating apparatus Volumetric apparatus: Volumetric flask, burette, pipette, analytical balance, electronic balance. Heating apparatus: Bunsen burner, water bath, sand bath, hot air oven, heating mantle	1	15

	(C) Miscellaneous Apparatus Buchner funnel, burner, test tube stand, tong, burette stand, clamp, china dish, wire gauze, cork, vacuum pumps, crucibles, clay pipe triangle, pestle and mortar, spatulas, thermometer, pH meter, Kipp's apparatus		
2	**Laboratory Reagents And Solvents Reagents** Classification of reagents according to their action; (i) acids (ii) bases (iii) salts (iv) complexing agents (v) oxidizing and reducing agents (vi) precipitating agents (vii) chelating agents. Each type to be explained with at least one suitable example. Primary and secondary standards: Definition, characteristics, uses examples for different types of reactions. Solvents: Solute, Solvent & Solution, classification of solvents (i) Protic and aprotic (ii) Acidic, basic amphiprotic and neutral (iii) Aqueous and non-aqueous (iv) Polar and nonpolar. Each type is to be explained with at least one example.	1	15

Books Recommended:

1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by GH Jeffery and others) 5th Ed. The English Language Book Society of Longman

2. Willard, Hobert H. et. al: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.

3. Christian, Gary D; Analytical Chemistry, 6th Ed. New York- John Willy, 2004.

4. Harris, Daniel C,Quantitative Chemical Analysis, 3rd Edition, W.H. Freeman and Company, New York, 2001.

5. Khopkar, S.M. Basic Concepts of Analytical Chemistry New Age, International Publisher, 2009.

6. Koogs, West and Holler, Fundamentals of Analytical Chemistry, 6th Edition, Sauders College Publishing, New York. 1991.

Further Reading:

Suggestive Digital Platforms Web Links:

1. http://chemcollective.org/vlabs
2. https://www.vlab.co.in/broad-area-chemical-sciences
3. https://wp.labster.com/chemistry-virtual-labs/
4. https://www.youtube.com/watch?v=O_nyEj_hZzg

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE106A

Type of course : Skill Enhancement Course SEC
Name of course : Chemical Laboratory Management
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. 1. To understand and appreciate role of laboratory assistants chemicals laboratories at school, college and university level.
2. Handling of chemicals in safer ways.
3. To manage chemicals and assist students in learning of chemical experiments.

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in prepare solutions in the laboratory.
2. This course will prepare students for entry-level roles in the industry.
3. A proper chemical lab management will help in safety of chemical sciences department and success to reach different applications

Unit	Topic	Credit	Hr
1	**Laboratory assistant** – Duties and Qualifications of laboratory assistant, Lab Assistant job title, Tasks and duties, different type of lab duties, Essential skills in laboratory assistant, Role and responsibilities, Duties of lab assistant in school, college and University Understanding safety rules, Maintaining record of students usage of chemicals and glasswares, use greener ways and reduce waste in labs. Design Experimental Products for Degradation after Use. Labelling of chemicals, classification of	1	15

	chemical mixtures.		
2	**Fundamentals of laboratory management**, Types of laboratory management, Importance of quality of laboratory management, Management of chemicals-Acquisition of chemicals, Receiving the chemicals, Inventory and tracking of chemicals, Chemical segregation, storage limitations, Guidance on Safe Storage of Chemicals in Laboratories: Principles of Safe Storage, checking Quality of chemicals . **Laboratory safety manual:** chemical management questions, Laboratory information system, Lab Collector LIMS,	1	15

Books Recommended:

1. Prudent Practices in the Laboratory, Handling and Management of Chemical Hazards, National research Council, committee on Prudent Practices in laboratory, National Academic Press, 2011.
2. Laboratory Quality/Management by Parson Kenneth N, Publisher Xilbris, Atlantic publishers Hardcover, 2006.
3. Safe Storage of Laboratory Chemicals, Hardcover 2nd edition, Printed May 1991 by Wiley-Inter science.

Further Reading:

1. Laboratory Work in Chemistry by Keiser Edward H., Publisher: Forgotten Books
2. Laboratory Management System - General Requirements by Kumar Pawan Bharati) Publisher: Discovery Publishing House Pvt Ltd, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE106B

Type of course : Skill Enhancement Course SEC
Name of course: Soil Testing and Analysis
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. 1. To estimate the physical properties and available nutrient status (macro, secondary and micro-nutrients) of soils.
2. Evaluation of fertility status of soil
3. To provide soil test based recommendations to farmers for improving soil fertility and economic return to farmers.

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in assessing land suitability for various agricultural and non-agricultural uses.
2. Explores the problems and potentials of soil and decide the most appropriate land use.
3. Soil analysis is a valuable tool for your farm as it determines the inputs required for efficient and economic production.
4. A proper soil test will help ensure the application of enough fertilizer to meet the requirements of the crop while taking advantage of the nutrients already present in the soil.

Unit	Topic	Credit	Hr
1	**Introduction:** Definition of Soil, Formation of Soil, Types of Soils & Basic Concepts. Soil Components: Air, Water, inorganic and organic solids,	1	15

	Properties of Soil: A) Physical Properties :- Soil Separates, Texture, Aggregation and Structure, Temperature, Colour, Properties of Soil Mixture, Pore Space, Bulk Density, Particle Density, Aeration and Drainage, Compaction, Surface area, Soil water relationships. B) Chemical Properties :- Morphology of Colloids, Chemistry of Clays, Ionic Exchange, Acidity, Alkalinity, pH, Salinity, Reactions in Liming and Acidification. C) Biological Properties :- Soil Organic Matter, C: N Relationships, N-Transformation, Soil Organisms, Sulfur Transformation.		
2	**Sample Collection and Processing:** Purpose of Soil testing and analysis, selection of field, Method of Soil Sample collection Methods of soil sample processing, precautions during soil collection & processing, Preservation labeling and Storage of soil samples, various types of boys used for collection. **Study of Instruments:** PH Meter, Conductivity meter, spectrometer, UV-Spectrophotometer, use of soil testing kit and mobile soil testing van. Kjeldahl's Assembly for determination of nitrogen. **Soil Test Report & Fertilizer Recommendation:** Preparation of Soil analysis and test report, Fertilizer recommendation, preparation of soil test summaries and fertility maps.	1	15

Books Recommended :

1. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.
2. Fundamentals of soil science, foth, H.D. Wiley Books.
3. Soil Science and Management, Plaster, Edward J., Delmar Publishers.
4. Principles of Soil Chemistry (2Wed.) Marcel Dekker Inc., New York.

Further Reading:

5. Handbook of Agricultural Sciences, S.S.Singh, P.Gupta, A.k.Gupta, Kalyani Publication.
6. Soil Sampling, Preparation and analysis, Marcell Dekker, Inc, New York.
7. Soil Sampling and methods of analysis, carter M.R. and E.G.Gregorich, 2007, 2nd Ed..
8. Methods of soil analysis, Part, American society of Agronomy Inc., Kuete, A.Et.at., 1986.

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PATAN - 384 265

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ONE EARTH • ONE FAMILY • ONE FUTURE

पावका नः सरस्वती

FACULTY OF SCIENCE

B.Sc. (Honours) BOTANY

(With Research/without Research)

SCIUG103

Semesters: I and II

(with multiple entry & exit option)

SYLLABUS

Curriculum as per UGC Guideline

Framed according to National Education Policy (NEP) - 2020

With effect from June – 2023 (and thereafter)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265

B.Sc. (Honours) Botany Programme

(With Research/without Research)

SCIUG103

NEP-2020

With effect from June – 2023 (and thereafter)

FACULTY OF SCIENCE

Subject: BOTANY

B. Sc. Semesters: I and II

Total Pages: 01 to 69

Submitted on

Date: /06/2023

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265

BOARD OF STUDIES (BOS) IN BOTANY

References: No. AK/AxS/2125/2020 Dt. 28/08/2020.
No. AK/AxS/2315/2020 Dt. 04/09/2020.
No. AK/AxS/3006/2020 Dt. 01/10/2020.

No.	Name of BoS Members	Designation
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14.	Dr. JAGDISHBHAI N. PATEL	CO-OPT MEMBER

B.Sc. Semester I Courses :: BOTANY::

Theory Courses	Programme Code	Title (Course Code)	Practical Courses
Major (MJDSC) (credits: 4+4)	SCIUG103	MICROBIOLOGY AND PHYCOLOGY (SC23MJDSCBOT101) (credits: 4)	MICROBIOLOGY AND PHYCOLOGY (SC23PMJDSCBOT101) (GROUP A+ GROUP B) (credits: 2+2)
Minor (MiDSC) (credits: 2+2)	SCIUG103	MICROBES AND ALGAE (SC23MiDSCBOT102) (credits: 2)	MICROBES AND ALGAE (SC23PMiDSCBOT102) (credits: 2)
Multi/Inter Disciplinary(MDC) (credits: 2+2)	SCIUG103	PLANT IN EVERYDAY LIFE (SC23MDCBOT103) (credits: 2)	PLANT IN EVERYDAY LIFE (SC23PMDCBOT103) (credits: 2)
Ability Enhancement (AEC) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23MDCBOT104) (credits: 2)	—
Indian Knowledge System (IKS) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23IKSBOT105) (credits: 2)	—
Skill Enhancement (SEC) (credits: 2)	SCIUG103	HORTICULTURE (SC23SECBOT106) (credits: 2)	—

B.Sc. Semester II Courses :: BOTANY::

Theory Courses	Programme Code	Title (Course Code)	Practical Courses
Major (MJDSC) (credits: 4+4)	SCIUG103	BIOMOLECULES AND CELL BIOLOGY (SC23MJDSCBOT201) (credits:4)	BIOMOLECULES AND CELL BIOLOGY (SC23PMJDSCBOT201) (GROUP A+ GROUP B) (credits:2+2)
Minor (MiDSC) (credits: 2+2)	SCIUG103	ORGANIC MOLECULES AND CYTOLOGY (SC23MiDSCBOT202) (credits:2)	ORGANIC MOLECULES AND CYTOLOGY (SC23PMiDSCBOT202) (credits:2)
Multi/Inter Disciplinary(MDC) (credits: 2+2)	SCIUG103	FRUITS AND VEGETABLE PROCESSING (SC23MDCBOT203) (credits:2)	FRUITS AND VEGETABLE PROCESSING (SC23PMDCBOT203) (credits:2)
Ability Enhancement (AEC) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23MDCBOT204) (credits:2)	—
Indian Knowledge System (IKS) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23IKSBOT205) (credits:2)	—
Skill Enhancement (SEC) (credits: 2)	SCIUG103	NATURAL RESOURCE MANAGEMENT (SC23SECBOT206) (credits: 2)	—

CONTENTS

SUMMARY OF THE PROGRAMME

SYLLABUS DURATION	**SEMESTER PATTERN *I.E.*, SIX MONTHS (single major)**
THEORY	
No. of Discipline Specific Major Core Courses (MJDSC)	***01/Semester***
Credits per Discipline Specific Major Core Course (MJDSC)	*04*
Total credits for Discipline Core Major Course (MJDSC)	***04/Semester***
Theory lectures per Discipline Major Core Course (MJDSC)	*04/week*
No. of Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) & Value Added Course (VAC)/Indian Knowledge System (IKS)	***01/Semester***
Credits per Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) & Value Added Course (VAC)/ Indian Knowledge System (IKS)	*02*
Total credits for Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC) Skill Enhancement Courses (SEC) & Value Added Course (VAC)/ Indian Knowledge System (IKS)	***02/Semester***
Theory lectures per Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC) Skill Enhancement Courses (SEC) & Value Added Course (VAC)/ Indian Knowledge System (IKS)	*02 /week*
PRACTICAL	
No. of Practical courses *per Discipline Specific Major Core Courses (MJDSC)*	***01 (in each semester)***
Credits per Practical course	***04(GROUP A:2+GROUP B:2)***
Total Credits of Practical course	*02+02/Semester*
Total Practical lectures	*08(04 +04/week/ batch)*
No. of Practical course (in Uni. Exam.)	***01****/Semester* ***(GROUP A+GROUP B)***
No. of Practical courses *per Discipline Specific Minor (MiDSC) & Multi /Inter Disciplinary Courses (MDC / IDC)*	***01 (in each semester)***
Credits per Practical course	***02***
Total Credits of Practical course	*02/Semester*
Total Practical lectures	*04/week/ batch*
No. of Practical course (in Uni. Exam.)	***01****/Semester*
EVALUATION	
Examination (including Preparation - week)	***5***
No. of Days per week	***6***
Week (days) available for Teaching	***15*** *(90)*
Duration of each lecture (minutes)	***55***
No. of students/batch	***20*** *(on approval of AC and Exam. Unit)*

Framed according to National Education Policy (NEP) - 2020

Under Choice Based Credit System-Semester-Grading System pattern

UG (B. Sc.) Programme in Botany

Semester-I and II

PREAMBLE:

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. The upgradation of undergraduate programmes in the line of NEP, 2020 will play an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. A holistic and multidisciplinary education would aim to develop all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such an education will help develop well-rounded individuals that possess. Such changes will further result in learning outcome based curriculum in order to maximize the benefits of the newly designed curriculum. The learning outcome based curriculum in general and in Botany in particular will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this.

The template as developed has the provision of ensuring the integrated personality of the students in terms of providing opportunity for exposure to the students towards core courses, discipline specific courses, generic elective courses, ability enhancement courses and skill enhancement courses with special focus on technical, communication and subject specific skills through practical and other innovative transactional modes to develop their employability skills. The template of learning outcome based framework has categorically mentioned very well defined expected outcomes for the programme like core competency, communication skills, critical thinking, affective skills, problem-solving, analytical, reasoning, research-skills, teamwork, digital literacy, moral and

ethical awareness, leadership readiness and so on along with very specific learning course outcomes at the starting of each course. Therefore, this template on Learning Outcomes based Curriculum Framework (LOCF) for B.Sc. with Botany/ Botany Honours under the University will be in the line of NEP, 2020 – more flexible, multi-disciplinary, holistic and will definitely be a landmark in the field of outcome based curriculum construction.

Today plant science is a fusion of the traditional components with the modern aspects of biochemistry, molecular biology and biotechnology. Over the years, plant science (Botany) has shown enormous gain in information and applications owing to tremendous inputs from research in all its aspects. With global recognition of the need for conservation, field plant biologists have contributed significantly in assessing plant diversity. Taxonomists have explored newer dimensions for the classification of plants. New insights have been gained in functional and structural aspects of plant development by utilizing novel tools and techniques for botanical research. Challenging areas of teaching and research have emerged in ecology and reproductive biology. Concern for ever increasing pollution and climate change is at its highest than ever before. Keeping these advancements in view, a revision of the curriculum at the undergraduate level is perfectly timed. From the beginning of the session, the Botany students across Indian Universities shall have the benefit of a balanced, carefully-crafted course structure taking care of different aspects of plant science, namely plant diversity, physiology, biochemistry, molecular biology, reproduction, anatomy, taxonomy, ecology, economic botany and the impact of environment on the growth and development of plants. All these aspects have been given due weightage over the six semesters. It is essential for the undergraduate students to acquaint themselves with various tools and techniques for exploring the world of plants up to the sub- cellular level. A paper on this aspect is proposed to provide such an opportunity to the students before they engage themselves with the learning of modern tools and techniques in plant science. Keeping the employment entrepreneurship in mind, applied courses have also been introduced. These courses shall provide the botany students hands on experience and professional inputs. On the whole, the curriculum is a source of lot of information and is supported by rich resource materials. It is hoped that a student graduating in Botany with the new curriculum will be a complete botanist at Honours level.

NEP-2020:

NEP, 2020 aims at a new and forward-looking Vision for India's Higher Education System. This curriculum framework for the bachelor-level program in Botany is developed keeping in view of the student centric learning pedagogy, which is entirely multidisciplinary outcome-oriented and curiosity-driven. To avoid rote -learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum framework focuses on pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works. The platform aims at equipping the graduates with necessary skills for botany-related careers, careers with general graduate-level aptitude and for higher education in Botany and allied subjects. Augmented in this framework are graduate attributes including critical thinking, basic psychology, scientific reasoning, moral ethical reasoning and so on, qualification descriptors that are specific outcomes pertinent to the discipline of botany, learning outcomes for the two programmes these frameworks have been developed, learning outcomes for individual courses, pedagogical methods and assessment methods. Looking at all these new concepts and progress, the detailed syllabus of B.Sc. (H) – Botany has been designed and decided to be implemented from the academic session from June 2023-24.

APPROACH TO CURRICULUM PLANNING:

While designing these frameworks, emphasis is given on the objectively measurable teaching-learning outcomes to ensure employability of the graduates. In line with recent trends in education section, these frameworks foster implementation of modern pedagogical tools and concepts such as flip-class, hybrid learning, MOOCs and other e-learning platforms. In addition, the framework pragmatic to the core; it is designed such a way to enable the learners implementing the concepts to address the real world problems. A major emphasis of these frameworks is that the curriculum focuses on issues pertinent to India and also of the west; for example, biodiversity and conservation of endemic and threatened species that are found in India, Indian climatological variables, Indian biodiversity and so on. Above all, these frameworks are holistic and aim to mould responsible Indian citizen who have adequate skills in reflective thinking, rational skepticism, scientific temper, digital literacy and so on such that they are equipped to fight immediate social issues apropos to Indian milieu, including corruption and inequity.

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications such as a Bachelor's Degree (Hons) programmes are earned and awarded on the basis of (a) demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and (b) academic standards expected of graduates of a programme of study.

Learning outcomes-based frameworks in any subject must specify what graduates completing a particular programme of study are (a) expected to know, (b) understand and (c) be able to do at the end of their programme of study. To this extent, LOCF in Botany is committed to allowing for flexibility and innovation in (i) programme design and syllabi development by higher education institutions (HEIs), (ii) teaching-learning process, (iii) assessment of student learning levels, and (iv) periodic programme review within institutional parameters as well as LOCF guidelines, (v) generating framework(s) of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes. HEIs, on their turn, shall address to the situations of their students by identifying relevant and common outcomes and by developing such outcomes that not only match the specific needs of the students but also expands their outlook and values.

NATURE AND EXTENT OF BACHELOR'S DEGREE PROGRAMME IN BOTANY (HONOURS):

A bachelor's degree in Botany with Research or without Research is a 4 year degree course which is divided into 8 semesters.

Sl. No.	NCRF Credit Levels	Type of Award	Stage of Exit	Mandatory Credits to be secured for the Award
1	4.5	Certificate in the Discipline	After successful completion of 1st Year	44
2	5.0	Diploma in the Discipline	After successful completion of 1st and 2nd Years	88
3	5.5	B.Sc. Degree in Botany	After successful completion of 1st, 2nd and 3rd Years	132
4	6.0	B.Sc. (Honours with Research) / (without Research) in Botany	After successful completion of 1st, 2nd, 3rd and 4th Years	176

A student pursuing 4 years undergraduate programme with research in a specific discipline shall be awarded an appropriate Degree in that discipline on completion of 8th Semester if he/she secures 176 Credits. Similarly, for certificate, diploma and

degree, a student needs to fulfil the associated credits. An illustration of credits requirements in relation to the type of award is illustrated as above.

Bachelor's Degree (Honours) is a well-recognized, structured, and specialized graduate level qualification in tertiary, collegiate education. The contents of this degree are determined in terms of knowledge, understanding, qualification, skills, and values that a student intends to acquire to look for professional avenues or move to higher education at the postgraduate level.

Bachelor's Degree (Honours) programmes attract entrants from the secondary level or equivalent, often with subject knowledge that may or may not be directly relevant to the field of study/profession. Thus, B.Sc. (Honours) Course in Botany aims to equip students to qualify for joining a profession or to provide development opportunities in particular employment settings. Graduates are enabled to enter a variety of jobs or to continue academic study at a higher level.

AIMS:

1. To transform curriculum into outcome-oriented scenario.
2. To develop the curriculum for fostering discovery-learning.
3. To equip the students in solving the practical problems pertinent to India.
4. To adopt recent pedagogical trends in education including e-learning, flipped class, hybrid learning and MOOCs
5. To mold responsible citizen for nation-building and transforming the country towards the future.
6. To provide an environment that ensures cognitive development of students in a holistic manner. A dialogue about plants and its significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects.
7. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A Botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
8. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
9. To enable the graduate prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination.

PROGRAM LEARNING OUTCOMES:

The student graduating with the Degree B.Sc. (Honours) Botany should be able to acquire

PO 1: Knowledge: Students will acquire core competency in the subject Botany, and in allied subject areas. The student will be able to identify major groups of plants and compare the characteristics of lower (e.g. algae and fungi) and higher (angiosperms and gymnosperms) plants.

- Students will be able to use the evidence based comparative botany approach to explain the evolution of organism and understand the genetic diversity on the earth.
- The students will be able to explain various plant processes and functions, metabolism, concepts of gene, genome and how organism's function is influenced at the cell, tissue and organ level.
- Students will be able to understand adaptation, development and behavior of different forms of life.
- The understanding of networked life on earth and tracing the energy pyramids through nutrient flow is expected from the students.
- Students will be able to demonstrate the experimental techniques and methods of their area of specialization in Botany.

PO 2: Critical Thinking and problem solving ability: An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course. Students will become critical thinker and acquire problem solving capabilities.

PO 3: Digitally equipped: Students will acquire digital skills and integrate the fundamental concepts with modern tools.

PO 4: Ethical and Psychological strengthening: Students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses.

PO 5: Team Player: Students will learn team workmanship in order to serve efficiently institutions, industry and society.

PO 6: Independent Learner: Apart from the subject specific skills, generic skills, especially in botany, the program outcome would lead to gain knowledge and skills for further higher studies, competitive examinations and employment. Learning outcomes based curriculum would ensure equal academic standards across the country and

broader picture of their competencies. The Bachelor program in Botany and Botany honours may be mono-disciplinary or multidisciplinary.

SALIENT FEATURES:

- B.Sc. (Honours) Botany in UG programme - **Semester I and II** shall be offered from the Academic year, June **2023**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2023-24.
- A student will have to get enrolled a **Discipline Specific Core Course (DSC)** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting a **Multi/ Inter disciplinary Course (MDC/ IDC), Ability Enhancement Course (AEC), Skill Enhancement Course (SEC)** as well as **Value Added Course (VAC)/Indian Knowledge System (IKS)** from a pool of courses.
- ***Academic Bank of Credits (ABC)*** is an academic service mechanism as a digital/virtual/online entity established and managed by MOE/UGC. This will facilitate students to become its academic account holders and paving the way for seamless student mobility between or within degree-granting Higher Education Institutions (HEIs) through a formal system of credit recognition, credit accumulation, credit transfers and credit redemption to promote distributed teaching- learning from various recognized institutions, approved ODL and other sources to increase their knowledge, capacities and skills. ABC shall be established on the lines of "National Academic Depository" (NAD) as a Special Purpose Vehicle (SPV). It shall have a dynamic website providing all details of ABC, operational mechanism for the use of all stakeholders of higher education.
- Each course shall be assigned a specific number of **Credits**.
- Discipline Specific Core Course **(DSC)** is the course which should compulsorily be studied by a candidate as a Major and Minor requirement so as to get degree in a said discipline of study.
- There shall be a **Major (MJDSC) Compulsory** course (Theory) with **4 credits** and their practical's with **4 (Group A: 2+ Group B: 2) credits**.
- One **Minor (MiDSC) Compulsory** course and **Multi/ Inter disciplinary Course (MDC/ IDC)** (Theory) each with **2 credits** in each semester and their practical's each with **2 credits**.

- In addition to the Major/Minor course, a student will have to choose **MDC/IDC, AEC, SEC** as well as **VAC/IKS** from a pool of courses.
- **AEC, SEC** and **VAC/IKS** courses shall have to be offered. The credit weight-age for **AEC, SEC, VAC/IKS** course shall be of **2 credits**.
- Each course shall have a unique Course code. The Discipline Specific Core Course, Inter/Multi-Disciplinary Course, Ability Enhancement Course, Value Added Course and Skill Enhancement Course shall be abbreviated respectively as **DSC, IDC/MDC, AEC, VAC/IKS and SEC.**

1. Discipline Specific Core Course DSC- Major **(MJDSC) &** Minor **(MiDSC)**
   Practical Discipline Specific Core Course **PDSC- PMJDSC & PMiDSC.**
2. Multi/Inter Disciplinary Course **MDC/IDC**
   Practical Multi/Inter Disciplinary Course **PMDC/PIDC**
3. Ability Enhancement Course **AEC**
4. Skill Enhancement Course **SEC**
5. Value Added Course **VAC**
6. Indian Knowledge System **IKS**

- Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to **90 working days**. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.
- The theory course with **4 credits** shall be of **60 hrs** (15 weeks x 4 credits) duration and the course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.
- The **Practical** course **with 4 credits** shall be of **120 hrs** (15 weeks x 8 hours) duration and the **Practical** course **with 2 credits** shall be of **60 hrs** (15 weeks x 4 hours) duration.

GENERAL FRAMEWORK:

- *A general framework for Bachelor of Science (B. Sc.) with Honours programme with Research/without Research shall be as follows:*

Semester wise credits								Total credits of the Programme
I	II	III	IV	V	VI	VII	VIII	
22	22	22	22	22	22	22	22	176

SEMESTER WISE WEIGHTAGE:

- *The semester wise weightage of major, minor, multi/inter disciplinary, AEC, SEC and VAC/IKS shall be as follows:*

Academic year	Core Compulsory Courses	Multi/ Inter Disciplinary courses	Ability Enhancement Course	Skill Enhancement Course	Value Added Course
Semester I & II	8% to 46%	3% to 16 %	0% to 9%	0% to 9%	(IKS) 0% to 9%
Semester III	14% to 41%	3% to 15%	0% to 9%	0% to 9%	0% to 9%
Semester IV	17% to 56%	-	0% to 9%	0% to 9%	0% to 9%
Semester V	19% to 72%	-	-	0% to 9%	-
Semester V I	17% to 56%	-	0% to 9%	0% to 18%	-
Semester VII & VIII	**Major**	**With Research or without Research (RP/OJT)**			
	18% to 56%	0% to 26%			

ATTENDANCE:

The attendance rules as per the norms of Hemchandracharya North Gujarat University, Patan.

MEDIUM OF INSTRUCTION:

The Medium of Instruction shall be of **Gujarati medium**. Student is free to write answers either in **Gujarati** and/or **English** language.

TEACHING LEARNING PROCESS:

Teaching and learning in this programme involve classroom lectures as well tutorials. It allows-

- The tutorials allow a closer interaction between the students and the teacher as each student gets individual attention.
- Written assignments and projects submitted by students
- Project-based learning
- Group discussion
- Home assignments
- Quizzes and class tests
- PPT presentations, Seminars, interactive sessions
- Diversity survey
- Co-curricular activity etc.
- Industrial Tour or Field visit

LANGUAGE OF QUESTION PAPER:

Question paper should be drawn in **Gujarati** language and its **English** version should be given.

EVALUATION METHODS:

Academic performance in various courses *i.e.* **MJDSC, MiDSC, MDC/IDC, AEC, SEC, VAC/IKS** and **RP/OJT** are to be considered as parameters for assessing the achievement of students in the Botany subject. A number of appropriate assessment methods of Botany will be used to determine the extent to which students demonstrate desired learning outcomes.

Following assessment methodology should be adopted:

1. A student shall be evaluated through **Continuous and Comprehensive Evaluation (CCE)/ (*Internal Evaluation*)** and as well as the **Semester End Evaluation (SEE)** (***External Evaluation***). The weightage of theory and practical is ***25 marks per credit***. **CCE** shall be **50%**, whereas the weightage of the **SEE** shall be **50%**.

Sr. No.	Evaluation	4 credits subjects (Marks)	2 credits subjects (Marks)
1	**CCE (50%)** Classroom & Mid-Term Evaluation	50	25
2	**SEE (50%)**	50	25
	Total	**100**	**50**

2. In the **Continuous and Comprehensive Evaluation (CCE)/ (Internal Evaluation)** is spread through the duration of the course and is to be done by the Teacher teaching the course. BoS of the subjects will decide various criteria and their weight-age for CCE. The assessment is to be done by various means including:

Written Mode	Oral Mode	Practical Mode	Integrated Mode
1. Semester Exam 2. Class Test 3. Open book exam/test 4. Open note exam/test 5. Self-test/ Online test 6. Essay/Article writing 7. Quizzes/Objective test 8. Class assignment 9. Home assignment 10. Reports Writing 11. Research/Dissertation 12. Case Studies	1. Viva/Oral exam 2. Group Discussion 3. Role Play 4. Authentic Problem Solving 5. Quiz 6. Interview	1. Lab work 2. Computer simulation/ Virtual labs 3. Craft work 4. Co-curricular work	1. Paper presentation/ Seminar 2. Field Assignment 3. Poster presentation

NATURE AND OBJECTIVES OF VARIOUS TYPES OF EVALUATION:

Written Mode		
Evaluation Type	Nature	**Objectives**
Semester Exam	Traditionally essay type	For depth and planned preparation
Class test	Traditionally essay type	Fixed date forces students to learn
Open book test	Allowed choice of reference book	Measures what students can do with resources, less stress on
Open note test	To get used to the system	Encourage good note taking
Self-test	For subjective and objective items	Mastery learning occurs with proper feedback
Article/essay writing	Individual long written assignment	Individual expression and creativity
Quizzes/Objective test	Short duration structured test	Excellent validity as greater syllabus coverage
Class assignment	With defined time	Student's performance to make decision
Home assignment	With undefined time	Reinforce learning and facilitate mastery of specific skills
Reports Writing	On activities performed or event observed	Develop a key transferable skill
Research/Dissertation	Detailed research-based report	To judge creativity and research
Case Studies	**Analyse a given case (real or fictional)**	To assess thinking, value, and attitude

Oral Mode		
Evaluation Type	**Nature**	**Objectives**
Viva/Oral exam	Individually or in small group	Practical experience towards job interview situation
Group discussion	Small group of 2-5 members work on a joint task	Encourage teamwork
Role Play	Small group of 2-5 members work on a joint task	Develop personality
Authenticate problem solving	Small group of 2-5 members work on a joint task	Communication of ideas
Quiz	Small group of 2-5 members work on a joint task	Assess memory power
Interview	Individually	Judge the personal confidence level

Practical Mode		
Evaluation Type	**Nature**	**Objectives**
Lab work	Component of working with one's hand	Keep the students on the task
Computer simulation/virtua	Component of working with one's hand	To understand the practical exposure
Craft work	Component of working with one's hand	Encourage application of concepts learnt
Co-curricular work	Component of working with one's hand	For immediate feedback

Integrated Mode		
Evaluation Type	**Nature**	**Objectives**
Paper presentation/ Seminar	Group or individual work	Learn from others presentation
Field Assignment	Field visit with report	Develop observation and recording skills
Poster presentation	Group or individual work	Develop research, creativity, and discussion skills

MODELS OF EVALUATION:

Based on the types of evaluation, various models of evaluation implementation are suggested for theory, practical, self-study and work-based learning. The focus of these models is to encourage the students to improve on skills and performance.

Model for Theory Courses	
CCE- 50% (100)	**SEE- 50% (100)**
Exam Pattern	**Marks**
Class Test (best 2 out of 3)	30
Quiz (Best 3 out of 4)	30
Active Learning	10
Home Assignment	10
Class Assignment	10
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	100
Semester-End Evaluation (SEE)	100
Model for Project/Self Model for Project/Self-study course-study/ work	
Exam Pattern	**Marks**
Project Evaluation (Best 4 out of 5)	80
Participation in discussion	10
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	100
Semester-End Evaluation(SEE)	100

13. CCE and SEE shall be of 2 ½ hours for 4 credits course and 2 hours in case of 2 credits courses.

14. ***CERTIFIED JOURNAL:***

    The End of Semester Examination will be conducted by the University. A ***certified journal*** of the respective practical course **must be produced** at the time of practical examination by the student.

15. It will be compulsory for a candidate to obtain ***passing percentage*** in both Internal as well as External Evaluation. The passing marks for each course shall be **40%** as decided by concern Board of Studies (BoS) in Botany.

16. Promotion, Re-Admission and Time for Completion of course, Procedure for awarding grades, Provision for appeal, etc. as decided by the ***Hemchandracharya North Gujarat University***.

STUDY TOUR:

Botanical excursion/study tour may be arranged (by the concern faculty with prior permission of **HoD and/or Principal**) within state and/or outside the state to explore/study plant diversity in its natural habitats.

COMPUTATION OF SGPA:

SGPA is computed from the grades as a measure of the student's performance in each semester. It is the ratio of the sum of the product of the number of credits with the grade points and the sum of the number of credits. i.e.

$$\mathbf{SGPA\ (Si) = \sum (Ci\ X\ Gi) / \sum Ci}$$

Where Si is the SGPA for ith course, Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

CUMULATIVE GRADE POINT AVERAGE (CGPA)

The CGPA is based on the grades in all the courses taken after joining the programme of study. It is the ratio of the sum of the products of total credits scored in a particular semester with the SGPA scored by the student in that semester and the sum of the total number of credits of each semester. i.e.

$$\mathbf{CGPA = \sum (Ci\ X\ Si) / \sum Ci}$$

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

CERTIFICATE COURSE								
Part/Class	Subject code	Study Components	Instruction Hrs/Week	Examination			Credits	Exam Duration (Hours)
				CCE	SEE	Total		
B.Sc. Semester -I		**Semester-I**						
		Discipline Specific Core Course(DSC)						
	SC23MJDSCBOT101	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	**02:30**
	SC23MiDSCBOT102	Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	**02:00**
	SC23MDCBOT103	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	**02:00**
		Practical Course(PDSC)						
	SC23PMJDSCBOT101 (Group A+B)	Major Discipline Specific Core Courses (PMJDSC)	8	50	50	100	4	**05:00**
	SC23PMiDSCBOT102	Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	**02:30**
	SC23PMDCBOT103	Multi/Inter Disciplinary Courses (PMDC/PIDC)	4	25	25	50	2	**02:30**
		Ability Enhancement Course (AEC)						
	SC23AECBOT104	Ability Enhancement Courses (AEC) **(**Languages)	2	25	25	50	2	**02:00**
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
	SC23IKSBOT105	Indian Knowledge System (IKS)	2	25	25	50	2	**02:00**
		Skill Enhancement Course (SEC)						
	SC23SECBOT106	Skill Enhancement Course (SEC)	2	25	25	50	2	**02:00**
			30	**275**	**275**	**550**	**22**	
B.Sc. Semester -II		**Semester-II**						
		Discipline Specific Core Course(DSC)						
	SC23MJDSCBOT201	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	**02:30**
	SC23MiDSCBOT202	Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	**02:00**
	SC23MDCBOT203	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	**02:00**
		Practical Course(PDSC)						
	SC23PMJDSCBOT201 (Group A+B)	Major Discipline Specific Core Courses (PMJDSC)	8	50	50	100	4	**05:00**
	SC23PMiDSCBOT202	Minor Discipline Specific Core Courses (PMiDC)	4	25	25	50	2	**02:30**
	SC23PMDCBOT203	Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	**02:30**
		Ability Enhancement Course (AEC)						
	SC23AECBOT204	Ability Enhancement Courses (AEC) **(**Languages)	2	25	25	50	2	**02:00**
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
	SC23VACBOT205	Value Added Courses (VAC)	2	25	25	50	2	**02:00**
		Skill Enhancement Course (SEC)						
	SC23SECBOT206	Skill Enhancement Course (SEC)	2	25	25	50	2	**02:00**
			30	**275**	**275**	**550**	**22**	

OPTION I BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
NCrF Credit Level	**Sem-ester**	**Major (Core) (72/ 116)**	**Minor (Electives) (32)**	**Multi/ Inter-disciplinary (10)**	**AEC (10)**	**SEC/ Internship (12)**	**VAC/ IKS (8)**	**RP/ OJT**	**Total Credits/ Sem. (144/176)**	**Qualification / Certificate**
Level		100	100	1 course	1 course	1 course	1 or 2 course	-	-	
4.5 1st Year	**I**	8	4	4	2	2 (SEC)	2 (IKS)	-	22	**UG Certificate**
	II	8	4	4	2	2 (SEC)	2 (VAC)	-	22	
1st Year Total Credits		**16**	**8**	**8**	**4**	**4**	**4**	**-**	**44**	
Exit 1: Award of UG certificate in Major course with 44 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for next NCrF credit level										
Level		200	(200 & above)	1 course	1 course	1 course	1 or 2 course	-	-	
5.0 2nd Year	**III**	12	-	4	2	2 (SEC)	2 (IKS)	-	22	**UG Diploma**
	IV	12	4	-	2	2 (SEC)	2 (VAC)	-	22	
2nd Year Total Credits		**40**	**12**	**12**	**8**	**8**	**8**	**-**	**88**	
Exit 2: Award of UG Diploma in Major course with 88 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for next NCrF credit level										
Level		300	(200 & above)	-	1 course	1 course	-	-	-	
5.5 3rd Year	**V**	12	8	-	-	2 (SEC)	-	-	22	**UG Degree**
	VI	12	4	-	2	4(Internship)	-	-	22	
3rd Year Total Credits		**64**	**24**	**12**	**10**	**14**	**8**	**-**	**132**	
Award of UG Degree in Major course with 132 credits and Internship in core discipline OR continue with Major and Minor course for next NCrF credit level										
Level		400	(300 & above)							
6.0 4th Year	**VII**	12	4	-	-	-	-	6 (OJT)	22	**UG Honours Degree**
	VIII	12	4	-	-	-	-	6 (OJT)	22	
4th Year Total Credits		**88**	**32**	**12**	**10**	**14**	**8**	**12**	**176**	
Award of UG Honours Degree in Major (without Research)course with total 176 credits										
OPTION II BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
6.0	**VII**	12	4	-	-	-	-	6 (RP)	22	**UG Honours with Research Degree**
	VIII	12	4	-	-	-	-	6 (RP)	22	
4th Year Total Credits		**88**	**32**	**12**	**10**	**14**	**8**	**12**	**176**	
Award of UG Honours with Research Degree in Major course with total 176 credits										

SEMESTER I

MAJOR DISCIPLINE SPECIFIC CORE COURSES:

PROGRAMME CODE: SCIUG103

SEM-I: SC23MJDSCBOT101: MICROBIOLOGY AND PHYCOLOGY

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Develop understanding on the concept of microbial nutrition.
- Classify viruses based on their characteristics and structures.
- Develop critical understanding of plant diseases and their remediation.
- Examine the general characteristics of bacteria and their cell reproduction/ recombination.
- Increase the awareness and appreciation of human friendly viruses, bacteria, algae and their economic importance.
- Conduct experiments using skills appropriate to subdivisions.

MINOR DISCIPLINE SPECIFIC CORE COURSES:

PROGRAMME CODE: SCIUG103

SEM-I: SC23MiDSCBOT102: MICROBES AND ALGAE

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Develop understanding on the concept of microbial nutrition.
- Classify viruses based on their characteristics and structures.
- Develop critical understanding of plant diseases and their remediation.
- Examine the general characteristics of bacteria and their cell reproduction/ recombination.
- Increase the awareness and appreciation of human friendly viruses, bacteria, algae and their economic importance.
- Conduct experiments using skills appropriate to subdivisions.

MULTI / INTER DISCIPLINARY COURSE:

PROGRAMME CODE: SCIUG103

SEM-I: SC23MDCBOT103: PLANTS IN EVERYDAY LIFE

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Understand core concepts of plants important and relate with environment, populations, communities, and ecosystems.
- Develop critical understanding on the evolution of concept of organization of apex.
- Increase the awareness and appreciation of plants & plant products encountered in everyday life.
- Appreciate the diversity of plants and the plant products in human use.

SKILL ENHANCEMENT COURSE:

PROGRAMME CODE: SCIUG103

SEM-I: SC23SECBOT106: HORTICULTURE

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Understand the different classifications of horticultural crops, nursery management, and use of technology in horticulture.
- Develop their competency on pre and post-harvest technology in horticultural crops.
- Analyze the different methods of weed control and harvest treatments of horticultural crops.
- Examine the economic implications of cultivation of tropical and sub-tropical vegetable crops.
- Evaluate the importance of floriculture and contribution spices and condiments on economy.

MAJOR DISCIPLINE SPECIFIC CORE COURSE -THEORY (MJDSC) *Programme Code: SCIUG103*							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. I***	***SC23MJ DSCBOT 101***	***Microbiology and Phycology***	**4**	**60hrs**	***50 Marks***	***50 Marks***

Course outcomes:

After the completion of the course the students will be able to:

1. Develop understanding about the classification and diversity of different microbes including viruses & Algae and their economic importance.
2. Develop conceptual skill about identifying microbes and algae.
3. Gain knowledge about developing commercial enterprise of microbial products.
4. Learn host –pathogen relationship and disease management.
5. Learn Presentation skills (oral & writing) in Botany by usage of computer of computer & multimedia.
6. Gain Knowledge about uses of microbes in various fields.
7. Understand the structure and reproduction of certain selected bacteria and algae.
8. Gain Knowledge about the economic values of this lower group of plant community.
8. Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry.

Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.

UNIT	***TOPIC***	***NO. OF LECTURES*** **(60hrs)**
Unit 1	**VIRUSES AND BACTERIA** • **Plant Viruses:** Discovery, physiochemical and biological characteristics; classification (Baltimore), RNA virus (**TMV**). • **Bacteria:** General characteristics of Bacteria; Cell structure-Salient features; Types of Bacteria based on flagella, Nutritional types (Brief explanation with suitable example). • **Reproduction:** Vegetative, Asexual and Recombination (conjugation and transformation).	**15**

	• Economic importance of Bacteria with reference to their role in agriculture, fermentation and medicine.	
Unit 2	**ALGAE** • General characteristics of algae, occurrence, and range of thallus organization (included types in syllabus); Classification system of Fritsch (included types up to family). • Cell structure and components: cell wall, pigment system, reserve food. • Reproduction in algae: Vegetative and Asexual methods. • Role of algae in the environment, agriculture, biotechnology and industry.	**15**
Unit 3	**CYANOPHYTA AND CHLOROPHYTA** • General characters of **Cyanophyta** and **Chlorophyta**. • Cell structure and components of ***Chlamydomonas***. • Life history of ***Nostoc*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction • Life history of ***Oedogonium*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction	**15**
Unit 4	**PHAEOPHYTA AND RHODOPHYTA** • General characteristics of **Phaeophyta** and **Rhodophyta**. • Life cycle types: Haplontic, Diplontic and Haplodiplontic. • Life history of ***Ectocarpus*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction • Life history of ***Batrachospermum*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction.	**15**

Suggested Readings:

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Wiley, J.M., Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGrawHill International.
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Campbell, N.A., Reec,e J.B., Urry, L.A., Cain, M.L., Wasserman, S.A.. Minorsky, P.V., Jackson, R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

<table>
<tr><td colspan="6">MAJOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (MJDSC)
Programme Code: SCIUG103</td></tr>
<tr><td rowspan="2">COURSE</td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td colspan="2">PRACTICAL</td></tr>
<tr><td>Credits</td><td>CCE</td><td>SEE</td></tr>
<tr><td>Certificate Course</td><td>B.Sc. I</td><td>SC23 PMJDSC BOT101</td><td>Microbiology and Phycology</td><td>4 (120 hrs)</td><td>50 Marks</td><td>50 Marks</td></tr>
<tr><td>Course outcomes:</td><td colspan="5">After the completion of the course the students will be able:
1. Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory.
2. Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes.
3. Practical skills in the field and laboratory experiments in Microbiology & Pathology.
4. Learn to identify Algae.
5. Can initiate his own Plant & Seed Diagnostic Clinic and
6. Can start own enterprise on microbial products.
Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</td></tr>
<tr><td colspan="5">PRACTICALS</td><td>NO. OF LECTURES (120 hrs)</td></tr>
<tr><td colspan="6">GROUP A</td></tr>
<tr><td colspan="5">• To study Bacteria using electron micrographs/ Models/ charts: Types of Bacteria based on flagella.
• To study cell structure of Chlamydomonas through chart/ permanent slide.
• To study the Life history of Nostoc through:
➢ Mounting - Thallus
➢ Mountings - Reproductive structure.
➢ Permanent Slide - Thallus
➢ Permanent Slide - Reproductive structure(Heterocyst).
• To study the Life history of Oedogonium through:
➢ Mounting - Thallus</td><td>60</td></tr>
</table>

➢ Mountings - Reproductive structure. ➢ Permanent Slide – Thallus, ➢ Permanent Slide – Cap cell, ➢ Permanent Slide – Sex organ - Oogonium.	
GROUP B	
• To study viruses using electron micrographs/ Models/ charts: **TMV**. • To study the Life history of ***Ectocarpus*** through: ➢ Mounting - Thallus ➢ Mountings - Reproductive structure ➢ Permanent Slide– Thallus, ➢ Permanent Slide– ***Ectocarpus unilocular*** sporangia. ➢ Permanent Slide– ***Ectocarpus plurilocular*** sporangia. • To study the Life history of ***Batrachospermum*** through: ➢ Mounting - Thallus ➢ Mounting - Reproductive structure. ➢ Permanent Slide– Thallus ➢ Permanent Slide– Cystocarp.	**60**

Suggested Readings:

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Wiley JM, Sherwood LM and Woolverton CJ. (2013). Prescott's Microbiology. 9th Edition. McGrawHill International.
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. SC. :: BOTANY PRACTICAL(MAJOR) :: SEMESTER-I

Programme Code: SCIUG103

MICROBIOLOGY AND PHYCOLOGY

SC23PMJDSCBOT101

(GROUP A & GROUP B)

Date: **Place:**

Time: 5 Hrs **Total Marks: 50**

Instructions: Strictly follow the instructions given by examiner(s).

GROUP A

1. Identify and classify giving reasons up to family of given specimen **A**. **06**

2. Make a temporary slide of the reproductive organ from the given specimen **B**. **06**
   Draw the labelled diagram of it and show your slide to the examiner.

3. Identify and describe as per given instructions: **06**
   I) Specimens – **C:** Electron micrographs/Models/charts/permanent slide
   (Types of Bacteria based on flagella*/Chlamydomonas*). (5 minute)
   II) Specimens – **D**: Electron micrographs/Models/charts/permanent slide
   (*Algae: Nostoc & Oedogonium*). (5 minute)

4. a. *Viva-voce* **03**
   b. Journal **04**

GROUP B

1. Identify and classify giving reasons up to family of given specimen **E**. **06**

2. Make a temporary slide of the reproductive organ from the given specimen **F**.
   Draw the labelled diagram of it and show your slide to the examiner. **06**

3. Identify and describe as per given instructions: **06**
   I) Specimen – **G:** Electron micrographs/Models/charts (**TMV**). (5 minute)
   II) Specimen – **H**: Electron micrographs/Models/charts/permanent slide
   (*Algae: Ectocarpus & Batrachospermum*). (5 minute)

4. a. *Viva-voce* **03**
   b. Journal **04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MINOR DISCIPLINE SPECIFIC CORE COURSE -THEORY (MIDSC) ***Programme Code: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B. Sc. I***	***SC23MiDSC BOT102***	***MICROBES AND ALGAE***	**2**	**30hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able to: 1. Develop understanding about the classification and diversity of different microbes including viruses and their economic importance. 2. Develop conceptual skill about identifying microbes. 3. Gain knowledge about developing commercial enterprise of microbial products. 4. Learn host –pathogen relationship and disease management. 5. Learn Presentation skills (oral & writing) in Botany by usage of computer of computer & multimedia. 6. Gain Knowledge about uses of microbes in various fields. 7. Understand the structure and reproduction of certain selected bacteria. 8. Gain Knowledge about the economic values of this lower group of plant community. 8. Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.						
UNIT	***TOPIC***						***NO. OF LECTURES*** **(30hrs)**
Unit 1	**VIRUSES AND BACTERIA** • **Plant Viruses:** Discovery, physiochemical and biological characteristics; classification (Baltimore), RNA virus (TMV). • **Bacteria**: General characteristics of Bacteria; Cell structure- Salient features; Types of Bacteria based on flagella, Nutritional types (Brief explanation with suitable example).						**10**

	• Reproduction: Vegetative, Asexual and Recombination (conjugation and transformation). • Economic importance of Bacteria with reference to their role in agriculture, fermentation and medicine.	
Unit 2	**<u>ALGAE</u>** • Life history of ***Nostoc*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction • Life history of ***Oedogonium*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction • Life history of ***Ectocarpus*** with reference to: ➢ Systematic position with reasons up to family ➢ Habit and Habitat, Vegetative structure and Reproduction	**20**

Suggested Readings:

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Wiley, J.M., Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGrawHill International.
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Campbell, N.A., Reec,e J.B., Urry, L.A., Cain, M.L., Wasserman, S.A.. Minorsky, P.V., Jackson, R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MINOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (PMiDSC) ***Programme Code: SCIUG103***						
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***CCE***	***SEE***
Certificate Course	**B.Sc. *I***	***SC23PMiDSC BOT102***	***MICROBES AND ALGAE***	**2 (60hrs)**	**25 *Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able: 1. Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory. 2. Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes. 3. Practical skills in the field and laboratory experiments in Microbiology & Pathology. 4. Can initiate his own Plant & Seed Diagnostic Clinic and Can start own enterprise on microbial products. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.					
UNIT	***TOPIC***			***NO. OF LECTURES*** **(60hrs)**		
Unit 1	• To study viruses using electron micrographs/ Models/ charts: **TMV**. • To study **Bacteria** using electron micrographs/ Models/ charts: Types of Bacteria based on flagella.			**20**		
Unit 2	• To study the Life history of ***Nostoc*** through: ➢ Mounting - Thallus ➢ Mountings - Reproductive structure. ➢ Permanent Slide - Thallus ➢ Permanent Slide – Reproductive structure(Heterocyst). • To study the Life history of ***Oedogonium*** through: ➢ Mounting - Thallus ➢ Mountings - Reproductive structure.			**40**		

	➢ Permanent Slide – Thallus, ➢ Permanent Slide – Cap cell, ➢ Permanent Slide – Sex organ - Oogonium. • To study the Life history of ***Ectocarpus*** through: ➢ Mounting - Thallus ➢ Mountings - Reproductive structure ➢ Permanent Slide– Thallus, ➢ Permanent Slide– ***Ectocarpus:*** **unilocular** sporangia. ➢ Permanent Slide– ***Ectocarpus:*** **plurilocular** sporangia.	

Suggested Readings:

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Wiley JM, Sherwood LM and Woolverton CJ. (2013). Prescott's Microbiology. 9th Edition. McGrawHill International.
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001). Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. SC. :: BOTANY PRACTICAL(MINOR) :: SEMESTER-I

Programme Code: SCIUG103

MICROBES AND ALGAE

SC23PMiDSCBOT102

Date: **Place:**

Time: 02:30 Hrs **Total Marks: 25**

Instructions: Strictly follow the instructions given by examiner(s).

1. Identify and classify giving reasons up to family of given specimen **A**. **05**
2. Make a temporary slide of the reproductive organ from the given specimen **B**. Draw the labelled diagram of it and show your slide to the examiner. **06**
3. Identify and describe as per given instructions: **06**

I) Specimen – **C**: Electron micrographs/Models/charts (5 minute)
(TMV/Types of Bacteria based on flagella)

II) Specimen – **D**: Electron micrographs/Models/charts (5 minute)
(*Algae: Nostoc, Oedogonium & Ectocarpus*)

5. a. *Viva-voce* **04**

   b. Journal **04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MULTI/INTER DISCIPLINARY COURSE-THEORY (MDSC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. I***	***SC23MDSCBOT103***	***PLANTS IN EVERYDAY LIFE***	**2**	**30hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able to: 1. This course is designed to give an overview of how plants are indispensable to humans. It gives a broad exposure to the various aspects of plant resource & its utilization. 2. Recall various economically and medicinally important plant species used in day-to-day life. 3. Explain the uses of economically important plants and illustrate the processing of various plant parts. 4. Analyze the utilization of various plant resources in day-to-day life. Apply theoretical knowledge in utilization, and report generation of economical and medicinal plants. Create awareness on conservation of medicinal plants and use of natural plant products as alternatives to synthetic products. **Pedagogy:** Lectures/ Tutorials/Assignments/Presentation / Demonstration/Field visit/Team based learning.						
UNIT	***TOPIC***						***NO. OF LECTURES* (30hrs)**
Unit 1	**<u>COMMON WILD PLANTS AND THEIR UTILIZATION:</u>** • Identification and utilization of following plants: ➢ Herde (*Terminalia chebula*) ➢ Behda (*Terminalia bellirica*) ➢ Amla (*Phyllanthus emblica*) ➢ Shimlo (*Bombax ceiba*)						**15**

	GRANDMA'S HERBAL POUCH: • Following plants to be studied with respect to botanical source, part of the plant used, and medicinal uses: ➢ Tulsi (*Ocimum sanctum*) ➢ Ardushi (*Adhatoda vasica*) ➢ Aadu (*Zingiber officinale*) ➢ Haldar (*Curcuma longa*)	
Unit 2	**PLANT RESOURCES AND UTILIZATION:** • Including brief description of plants and/or plant parts used of: ➢ Cereals: Rice and Wheat. ➢ Millets: Jowar and Bajra. ➢ Legumes: Green gram, Chickpea. ➢ Cash crops: Cashew, Sugarcane.	**15**

Suggested Readings:

1. Billings S and Collingwood S (2013). The Big book of home remedies. Lulu.com publisher.
2. Buckley, C (2020). Plant Magic: Herbalism in Real Life. Roost Books Publishers, New York.
3. Chrispeels, MJ and Sadava, DE (1994). Plants, Genes and Agriculture. Jones & Bartlett Publishers.
4. Fuller, KW and Gallon, JA (1985). Plant Products and New Technology. Clarendon Press, Oxford, New York.
5. Hill, AF (1952). Economic Botany: A Textbook of Useful Plants and Plant Products. McGraw Hill Publishing Company Ltd., New Delhi.
6. Kochhar, SL (2012). Economic Botany in the Tropics. MacMillan India Ltd., New Delhi.
7. Purohit, SS and Vyas, SP (2008). Medicinal Plant Cultivation: A Scientific Approach. Agrobios, India.
8. Rao, RS (1985-1986). Flora of Goa, Diu, Daman & Nagar-Haveli. 2 Volumes. Botanical Survey of India.
9. Shailesh, R (2019). Everyday Ayurveda: The complete book of Ayurvedic home remedies. Notion Press, India.

10. Sambamurty AVSS and Subramanyam NS (1989). A Textbook of Economic Botany. Wiley Eastern Ltd., New Delhi.
11. Sen, S (2009). Economic Botany. NCBA Publishers, New Delhi.
12. Sharma, OP (1996). Hill's Economic Botany. Tata McGraw Hill Publishing Company Ltd., New Delhi.
13. Simpson BB and Conner-Ogorzaly M (1986). Economic Botany - Plants in Our World. McGraw Hill, New York.
14. Singh V, Pande PC and Jain DK (2009). A Text Book of Economic Botany. Rastogi Publications, Uttar Pradesh.
15. Trivedi, PC (2006). Medicinal Plants: Ethnobotanical Approach. Agrobios, India.
16. Upadhyay, R (2023). Botany for B.Sc. students, Economic Botany, Ethnomedicine and phytochemistry/Commercial Botany and phytochemical Analysis. S. Chand and Company Ltd. Publishers, India.
17. Wickens, GE (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

<table>
<tr><td colspan="7">MULTI/INTER DISCIPLINARY COURSE-PRACTICAL (PMDSC)
PROGRAMME CODE: SCIUG103</td></tr>
<tr><td rowspan="2">COURSE</td><td rowspan="2">SEMESTER</td><td rowspan="2">COURSE CODE</td><td rowspan="2">COURSE TITLE</td><td colspan="3">PRACTICAL</td></tr>
<tr><td>Credits</td><td>CCE</td><td>SEE</td></tr>
<tr><td>Certificate Course</td><td>B.Sc. I</td><td>SC23PMD SCBOT103</td><td>PLANTS IN EVERYDAY LIFE</td><td>2 (60hrs)</td><td>25 Marks</td><td>25 Marks</td></tr>
<tr><td>Course outcomes:</td><td colspan="6">After the completion of the course the students will be able to:
1. This course is designed to give an overview of how plants are indispensable to humans. It gives a broad exposure to the various aspects of plant resource & its utilization.
2. Recall various economically and medicinally important plant species used in day-to-day life.
3. Explain the uses of economically important plants and illustrate the processing of various plant parts.
4. Analyze the utilization of various plant resources in day-to-day life.
Apply theoretical knowledge in utilization, and report generation of economical and medicinal plants. Create awareness on conservation of medicinal plants and use of natural plant products as alternatives to synthetic products.
Pedagogy: Lectures, Tutorials, Assignments, Demonstrations, live specimens, Herbarium specimens, Videos, Team based learning, Field visit and report writing.</td></tr>
<tr><td>UNIT</td><td colspan="5">TOPIC</td><td>NO. OF LECTURES (60hrs)</td></tr>
<tr><td>Unit 1</td><td colspan="5"><u>COMMON WILD PLANTS AND THEIR UTILIZATION:</u>
• Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of following plants:
➢ Harde (Terminalia chebula)
➢ Behda (Terminalia bellirica)
➢ Amla (Phyllanthus emblica)
➢ Shimlo (Bombax ceiba)</td><td>30</td></tr>
</table>

	GRANDMA'S HERBAL POUCH: • Following plants to be studied with respect to Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of ➢ Tulsi (*Ocimum sanctum*) ➢ Ardushi (*Adhatoda vasica*) ➢ Aadu (*Zingiber officinale*) ➢ Haldar (*Curcuma longa*)	
Unit 2	**PLANT RESOURCES AND UTILIZATION:** • Identification, Local and Botanical Name, Family, Useful Parts, Chemical constituents and utilization of following plants: ➢ Cereals: Rice and Wheat ➢ Millets: Jowar and Bajra ➢ Legumes: Green gram and Chickpea. ➢ Cash crops: Cashew and Sugarcane.	**30**

Suggested Readings:

1. Billings, S. and Collingwood, S. (2013). The Big book of home remedies. Lulu.com publisher.
2. Buckley, C (2020). Plant Magic: Herbalism in Real Life. Roost Books Publishers, New York.
3. Chrispeels, MJ and Sadava, DE (1994). Plants, Genes and Agriculture. Jones & Bartlett Publishers.
4. Fuller, KW and Gallon, JA (1985). Plant Products and New Technology. Clarendon Press, Oxford, New York.
5. Rao, RS (1985-1986). Flora of Goa, Diu, Daman & Nagar-Haveli. 2 Volumes. Botanical Survey of India.
6. Shailesh, R (2019). Everyday Ayurveda: The complete book of Ayurvedic home remedies. Notion Press, India.

7. Sen, S (2009). Economic Botany. NCBA Publishers, New Delhi.

8. Sharma, OP (1996). Hill's Economic Botany. Tata McGraw Hill Publishing Company Ltd., New Delhi.

9. Simpson, BB and Conner-Ogorzaly M (1986). Economic Botany - Plants in Our World. McGraw Hill, New York.

10. Singh, V, Pande ,PC and Jain, DK (2009). A Text Book of Economic Botany. Rastogi Publications, Uttar Pradesh.

11. Trivedi, PC (2006). Medicinal Plants: Ethnobotanical Approach.Agrobios, India.

12. Upadhyay, R (2023). Botany for B.Sc. students, Economic Botany, Ethnomedicine and phytochemistry/Commercial Botany and phytochemical Analysis. S. Chand and Company Ltd. Publishers, India.

13. Wickens, GE (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. Sc. :: BOTANY PRACTICAL :: SEMESTER-I

(MULTI/INTER DISCIPLINARY COURSE)

Programme Code: SCIUG103

PLANTS IN EVERYDAY LIFE

SC23PMDSCBOT103

Date: **Place:**

Time: 02:30 Hrs **Total Marks: 25**

Instructions: Strictly follow the instructions given by examiner(s).

1. Identify and write local name, botanical name, family, useful part, economic important (from unit 1). 10
   - Specimen A & B
2. Identify and write local name, botanical name, family, useful part, economic important (from unit 2). 10
   - Specimen C & D
3. a. *Viva-voce* 02

   b. Journal 03

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

SKILL ENHANCEMENT COURSE-THEORY (SEC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. I***	***SC23SEC BOT106***	***HORTICULTURE***	**2**	**30hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able: 1. To gain knowledge of gardening, cultivation, multiplication, raising of seedlings of garden plants. 2. To get knowledge of new and modern techniques of plant propagation. 3. To develop interest in nature and plant life. **Pedagogy:** Lectures, Tutorials, Assignments, Demonstrations, live specimens, Videos, Team based learning, Garden visit and report writing.						
UNIT	***TOPIC***						***NO. OF LECTURES*** **(30 hrs)**
Unit 1	**HORTICULTURE-I** 1. Introduction: Aims, Objectives and Scope of Horticulture 2. Plant Propagation-Vegetative, Asexual and Sexual reproduction 3. Nursery Management 4. Ornamental Plants						15
Unit 2	**HORTICULTURE-II** 1. Landscape: Principles, Types and Planning 2. Floriculture and its implements 3. Bonsai 4. Important Horticulture crops of Gujarat						15

Suggested Readings:

1. C.R. Adams (2018). Principles of Horticulture. Amsterdam. Boston.

2. Michael A. Dirr (2009). Manual of Woody and land Plants. Stipes Pub .

3. Salaria and Salaria (2013).A2Z Solutions Horticulture at a glance Vol.I. Jain Bros.

4. Chadha K. L. (2003).Handbook of Horticulture. Indian Council of Agricultural Research.

SEMESTER II

MAJOR DISCIPLINE SPECIFIC CORE COURSE:

PROGRAMME CODE: SCIUG103

SEM- II: SC23MJDSCBOT201: BIOMOLECULES AND CELL BIOLOGY

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Develop understanding on chemical bonding among molecules.
- Identify the concept that explains chemical composition and structure of cell wall and membrane.
- Classify the enzymes and explain mechanism of action and structure.
- Compare the structure and function of cells & explain the development of cells.
- Describe the relationship between the structure and function of biomolecules.

MINOR DISCIPLINE SPECIFIC CORE COURSE:

PROGRAMME CODE: SCIUG103

SEM- II: SC23MiDSCBOT202: ORGANIC MOLECULES AND CYTOLOGY

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Develop understanding on chemical bonding among molecules.
- Identify the concept that explains chemical composition and structure of plant.
- Classify the enzymes and explain mechanism of action and structure.
- Describe the relationship between the structure and function of biomolecules.

MULTI/INTER DISCIPLINARY COURSE:

PROGRAMME CODE: SCIUG103

SEM- II: SC23MDSCBOT203: FRUITS AND VEGETABLE PROCESSING

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Understand the different classifications of horticultural crops, nursery management, and use of technology in horticulture.
- Develop their competency on pre and post-harvest technology in horticultural crops.
- Analyze the different methods of weed control and harvest treatments of horticultural crops
- Examine the economic implications of cultivation of tropical and sub-tropical vegetable crops
- Evaluate the importance of floriculture and contribution spices and condiments on economy.

SKILL ENHANCEMENT COURSE:

PROGRAMME CODE: SCIUG103

SC23SECBOT206: NATURAL RESOURCE MANAGEMENT

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Understand the concept of different natural resources and their utilization.
- Critically analyze the sustainable utilization land, water, forest and energy resources.
- Evaluate the management strategies of different natural resources.
- Reflect upon the different national and international efforts in resource management and their conservation.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Zoology

Syllabus/ scheme

Semester – 1 to 2

With effect from

June-2023

Date: 12/08/2023 Total page: 41

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN	
B. Sc. (Zoology) Syllabus 2023 (according to NEP-2020)	
Document code	**Syllabus ZL- 2021**
Name of faculty	**Science**
Faculty code	**SCI**
Programme name	**B. Sc. ZOOLOGY**
Programme code	**SCIUG104**
Effective from	**June-2023**

The proposed new structure for B. Sc. course is based on NEP-2020 which is in force June-2023.

Course Pattern

1. This programme is divided into **Eight Semesters** (Four Years). The duration of an academic year consists of two semesters, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. Each semester has 22 credits and the programme is comprised of total 176 credits.
2. The theory courses with 4 credits shall have 60 hrs of direct classroom teaching workload (15 weeks × 4). The theory courses with 3 credits shall have 45 hrs of teaching workload (15 weeks × 3) and the theory courses with 2 credits shall have 30 hrs of teaching workload (15 weeks × 2).

Attendance: The attendance rules will be as per the rules and regulation of Hemchandracharya North Gujarat University, Patan.

Medium of Instruction: The medium of instruction shall be Gujarati but students are free to write answers in Gujarati or English in examination.

Language of question paper: Question paper should be drawn in Gujarati and English translation of the questions must be given in the question paper.

Number of students in each batch for practical examination should be 15.

Evaluation

Continuation and Comprehensive Evaluation (CEE)

1. For CEE of 50 marks following component should be used.

Sr. No.	Component	Marks
1	Daily/Weekly/Monthly unit test/ Internal exam	25
2	Assignment/ Quiz test	10
3	Development of soft skill (Seminar/ Group discussion)	05
4	Solving exercise/ Work base training/ Reading analysis	05
5	Attendance	05
	Total	**50**

2. For CEE of 25 marks following component should be used.

Sr. No.	Component	Marks
1	Daily/Weekly/Monthly unit test/ Internal exam	15
2	Assignment/ Quiz test	05
4	Attendance	05
	Total	**25**

Semester End Evaluation (SEE)

1. For SEE of 50 marks following question paper style should be used.

	Total marks	
Q. 1	10	Must be drawn from Unit 1 and will have three long questions out of which any two must be answered (5 marks each)
Q. 2	10	Must be drawn from Unit 2 and will have three long questions out of which any two must be answered (5 marks each)
Q. 3	10	Must be drawn from Unit 3 and will have three long questions out of which any two must be answered (5 marks each)
Q. 4	10	Must be drawn from Unit 4 and will have three long questions out of which any two must be answered (5 marks each)
Q. 5	10	08 short questions must be drawn from all units, out of which any 05 must be answered (2 marks each)
Total	**50**	

2. For SEE of 25 marks following question paper style should be used.

	Total marks	
Q. 1	10	Must be drawn from Unit 1 and will have three long questions out of which any two must be answered (5 marks each)
Q. 2	10	Must be drawn from Unit 2 and will have three long questions out of which any two must be answered (5 marks each)
Q. 3	05	08 short questions must be drawn from both units, out of which any 05 must be answered (1 marks each)
Total	**25**	

PROGRAM OBJECTIVE

1. The primary objective of the program is to impart quality education in the subject of Zoology as a basic science and its applied branches to the students.
2. To provide quality education in a branch of Biological sciences i.e., Zoology with different specializations.
3. To facilitate Higher education & research in zoology.
4. To provide quality education offering skill-based programs and motivate the students for self-employment in applied branches of Zoology.
5. To inculcate the spirit of resource conservation and love for nature.
6. To conduct field studies and different projects of local and global interests.
7. To provides opportunities for professional and personal development through curricular and co- curricular activities.
8. Provide consultancy and organize extension activities.

PROGRAMME OUTCOMES

1. To understand the complex phylogeny, physiology, immunology, endocrinology, development biology and evolution of different animals.
2. For instance, if you major in Zoology, you can also still take courses from across the other complementary.
3. Apply the wide range of subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.
4. Understand the applications of biological techniques to various fields of biology.
5. When you graduate with a Bachelor of Science (Zoology) you can serve as academician in different institutes.
6. The syllabus has been designed in such a way that it will give good experience to the student to work under pressure.

B. Sc. Semester I (Zoology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC ZOO101	Fundamentals of Zoology-I	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC ZOO102	Basics of Zoology-I	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC ZOO103	Introduction to Zoology-I	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC ZOO101	Fundamentals of Zoology-I Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Fundamentals of Zoology-I Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC ZOO102	Basics of Zoology-I Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC ZOO103	Introduction to Zoology-I Practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO104	English	2	25	25	50	2	2
Value added courses	SC23VAC ZOO105		2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO106	Apiculture	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

Semester I

B. Sc. Semester I (Zoology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC ZOO101	Fundamentals of Zoology-I	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC ZOO102	Basics of Zoology-I	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC ZOO103	Introduction to Zoology-I	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC ZOO101	Fundamentals of Zoology-I Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Fundamentals of Zoology-I Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC ZOO102	Basics of Zoology-I Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC ZOO103	Introduction to Zoology-I Practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO104	English	2	25	25	50	2	2
Value added courses	SC23VAC ZOO105		2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO106	Apiculture	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCZOO101

FUNDAMENTALS OF ZOOLOGY-I

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 04 (04 Period/Week)	**Theory**	**External-50 Marks**	
		Internal- 50 Marks	

Program Outcome:

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

Course Outcome:

1. The student shall have basic knowledge about general topics of classification of animals.
2. The student shall have basic knowledge about classification of acoelomates and pseudocoelomates up to class level and the functional anatomy of typical representative/s of different phylums
3. The student shall have basic knowledge about general topics of cytology.
4. The student shall have basic knowledge about general topics of wildlife biology.

Sr. No			Credit	Hr
1	Unit-1	• Principles of classification, Grades of body organization: level of organization, body symmetry, formation of germ layers, formation of coelom, body segmentation. • General characteristics and classification of protozoa (up to class) • Protozoan related diseases: infestation, symptoms and treatment (Malaria, Amoebiasis, Giardiasis, Kala-azar) • General characteristics and classification of phylum Porifera (up to class) • Canal system and types of spicules in sponges	1	15

2	**Unit-2**	• General characteristics and classification of phylum Cnidaria (up to class) • Type study *Hydra* (habit and habitat, external feature, locomotion, body wall, nervous system, reproductive system) • General characteristics and classification of phylum Platyhelminthes (up to class) • General characteristics and classification of phylum Nematoda (up to class) • Platyhelminthes and nematoda related diseases: Life cycle, infestation, symptoms and treatment (Cysticercosis, Ascariasis, Filariasis, Taeniasis)	**1**	**15**
3	**Unit-3**	• Cell discovery and cell theory (Robert Hook and Theodor Schwann), General cellular structure of prokaryotic and eukaryotic cell (Animal cell) • Structure of nucleus and chromosomes • Cell organelles structure and function: Ribosome, Golgi body, Endoplasmic Reticulum. Mitochondria, Centrioles, Lysosome • Cell cycle (normal cell and cancer cell) and Cell division (Amitosis, Mitosis & Meiosis)	**1**	**15**
4	**Unit-4**	• Scope and importance of wildlife: Definition of wildlife: causes of wildlife depletion; importance of wildlife, rare, endangered, threatened and endemic species of Gujarat and India • Wildlife protection: Reintroduction of wild animals and Wildlife Protection Act, 1972 and wildlife conservation methods (In situ and Ex situ conservation) • Protected areas: Some important National parks, Sanctuaries and Reserve forests in Gujarat. (Marine National Park, Gir National Park, Nal Sarovar Wildlife Sanctuary and Jessore Wildlife Sanctuary) • Tools and techniques used in study of wildlife biology	**1**	**15**

Reference:

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition

2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

Further Reading:

1. Verma PS and Agrawal VK, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

2. Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23PMJDSCZOO101
FUNDAMENTALS OF ZOOLOGY-I PRACTICAL
EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits-04	**Part A: 2 credit**	**(04 Period/Week)**	**Internal- 25 Marks**	**External-25 Marks**	**Total marks: 100**
	Part B: 2 credit	**(04 Period/Week)**	**Internal- 25 Marks**	**External-25 Marks**	

PART A
List of Practicals

1. Study of classification of Protozoa (up to class) using laboratory specimens, models, slides, charts (Amoeba, Euglena, Paramecium, Plasmodium)
2. Study of classification of phylum Porifera (up to class) using laboratory specimens, models, slides, charts (Sycon or Leucosolenia, Hylonema or Euplectella, Spongilla or Euspongia)
3. Study of classification of phylum Cnidaria (up to class) using laboratory specimens, models, slides, charts (Physalia or Hydra, Aurelia, Coral)
4. Study of histological structure of gonads of Hydra.
5. Study of classification of phylum Platyhelminthes and Nemetoda (up to class) using laboratory specimens, models, slides, charts (Planaria, Liver fluke or Polystomum, Tap worm, Ascaris or Filariaworm)
6. Study of external morphology of *Paramecium* and preparation of whole mount slide of *Paramecium* from culture.
7. Examination of pond water collected from different places for diversity in Protista
8. Study of life stages of *Fasciola hepatica*, *Taenia solium, Ascaris lumbricoides, Wuchereria bancrofti* (through Specimens / Slides/ micro-photographs)
9. Study of life stages of *Fascaris lumbricoides* and *Wuchereria bancrofti* (through Specimens / Slides/ micro-photographs)
10. Study of human parasitic diseases related to protozoan (Malaria, Amoebiasis, Giardiasis, Kala-Azar)
11. Study of Life cycle of Plasmodium, Ascaris and *Wuchereria bancrofti* using charts and slides
12. Study of human parasitic diseases related to Platyhelminthes and Nematoda (Cysticercosis, Ascariasis, Filariasis, Taeniasis)
13. Study of canal system of sponges using slide/chart
14. Study of different types of spicules of sponge using slide/chart

PART B

List of Practicals

1. To study compound microscope.
2. To study the structure of prokaryotic and eukaryotic cell using slide or chart.
3. To study typical eukaryotic onion cell under microscope
4. To study mitosis from onion root tip (Temporary / Permanent Slide)
5. Study of ultra structure of chromosome.
6. Study of different types of chromosomes.
7. Study of different Cell organelles: Eukaryotic Nucleus, Eukaryotic Ribosome and Endoplasmic Reticulum using charts or permanent slides
8. Study of cell cycle using chart.
9. Study of structure, procedure and type of microtome
10. Study of some important tools used in wild life: Camera, binocular, tripod, shot gun, tranquilizer, telescope/spotting scope.
11. Quantification of fauna using quadrate sampling method (calculation of density, abundance and frequency of occurrence)
12. Demonstration of census technique methods (line transect, belt transect, point count, mark capture-recapture method)
13. To map the distribution of rare and endangered animal species of Gujarat and India.
14. Study of various National Parks of Gujarat state.
15. Study of various Wildlife Sanctuaries of Gujarat state.
16. To visit any protected area (National park/Sanctuary) and prepare a report of visit.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
MINOR DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCZOO102

BASICS OF ZOOLOGY-I
EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Period/Week)	**Theory**	**External-25 Marks**	
		Internal- 25 Marks	

Program Outcome:

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

Course Outcome:

After thorough understanding of the content student will be able to explain:

1. Basic knowledge about general topics of classification of kingdom Animalia.
2. The economic and ecological importance of some Non-chordates

Sr. No			Credit	Hr
1	**Unit-1**	• Principles of classification,Grades of body organization: level of organization, body symmetry, formation of germ layers, formation of coelom, body segmentation. • General characteristics and classification of protozoa (up to class) • Protozoan related diseases: infestation, symptoms and treatment (Malaria, Amoebiasis, Giardiasis, Kala-azar) • General characteristics and classification of phylum Porifera (up to class) • Canal system and types of spicules in sponges		**15**

2	**Unit-2**	• General characteristics and classification of phylum Cnidaria (up to class) • Type study *Hydra* (habit and habitat, external feature, locomotion, body wall, nervous system, reproductive system) • General characteristics and classification of phylum Platyhelminthes (up to class) • General characteristics and classification of phylum Nematoda (up to class) • Platyhelminthes and Nematoda related diseases: Life cycle, infestation, symptoms and treatment (Cysticercosis, Ascariasis, Filariasis, Taeniasis)	**1**	**15**

Reference:

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition

2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

Further Reading:

1. Verma PS and Agrawal VK, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

2. Magguran, AE (1996). Ecological diversity and its measurements. Princeton University.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE: SC23PMIDSCZOO102

BASICS OF ZOOLOGY-I

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

List of Practicals

1. Study of classification of Protozoa (up to class) using laboratory specimens, models, slides, charts (Amoeba, Euglena, Paramecium, Plasmodium)
2. Study of classification of phylum Porifera (up to class) using laboratory specimens, models, slides, charts (Sycon or Leucosolenia, Hylonema or Euplectella, Spongilla or Euspongia)
3. Study of classification of phylum Cnidaria (up to class) using laboratory specimens, models, slides, charts (Physalia or Hydra, Aurelia, Coral)
4. Study of histological structure of gonads of Hydra.
5. Study of classification of phylum Platyhelminthes and Nemetoda (up to class) using laboratory specimens, models, slides, charts (Planaria, Liver fluke or Polystomum, Tap worm, Ascaris or Filariaworm)
6. Study of external morphology of *Paramecium* and preparation of whole mount slide of *Paramecium* from culture.
7. Examination of pond water collected from different places for diversity in Protista
8. Study of life stages of *Fasciola hepatica*, *Taenia solium, Ascaris lumbricoides, Wuchereria bancrofti* (through Specimens / Slides/ micro-photographs)
9. Study of life stages of *Fascaris lumbricoides* and *Wuchereria bancrofti* (through Specimens / Slides/ micro-photographs)
10. Study of human parasitic diseases related to protozoan (Malaria, Amoebiasis, Giardiasis, Kala-Azar)
11. Study of Life cycle of Plasmodium, Ascaris and *Wuchereria bancrofti* using charts and slides
12. Study of human parasitic diseases related to Platyhelminthes and Nematoda (Cysticercosis, Ascariasis, Filariasis, Taeniasis)
13. Study of canal system of sponges using slide/chart
14. Study of different types of spicules of sponge using slide/chart

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23MDCZOO103

INTRODUCTION TO ZOOLOGY-I

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Period/Week)		**Theory**	**External-25 Marks**
			Internal- 25 Marks

Program Outcome:

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

Course Outcome:

1. The student shall have basic knowledge about general topics of cytology.
2. The student shall have basic knowledge about general topics of wildlife biology.

Sr. No			Credit	Hr
1	**Unit-1**	• Cell discovery and cell theory (Robert Hook and Theodor Schwann), General cellular status of prokaryotic and eukaryotic cells Animal Cell) • Structure of nucleus and chromosomes • Cell organelles structure and function: Ribosome, Golgi body, Endoplasmic Reticulum. Mitochondria, Centrioles, Lysosome • Cell cycle (normal cell and cancer cell) and Cell division (Amitosis, Mitosis & Meiosis)	1	15
2	**Unit-2**	• Scope and importance of wildlife: Definition of wildlife: causes of wildlife depletion; importance of wildlife, rare, endangered, threatened and endemic species of Gujarat and India • Wildlife protection: Reintroduction of wild animals and Wildlife Protection Act, 1972 and Wildlife conservation	1	15

		methods (In situ and Ex situ conservation) • Protected areas: Some important National parks, Sanctuaries and Reserve forests in Gujarat. (Marine National Park, Gir National Park, Nal sarovar Wildlife Sanctuary and Jessore Wildlife Sanctuary) • Tools and techniques used in study of wildlife biology		

Reference:

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition

2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

Further Reading:

1. Verma PS and Agrawal Vk, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

2. Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23PMDCZOO103

INTRODUCTION TO ZOOLOGY-I

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

List of Practicals

1. To study compound microscope.
2. To study the structure of prokaryotic and eukaryotic cell using slide or chart.
3. To study typical eukaryotic onion cell under microscope
4. To study mitosis from onion root tip (Temporary / Permanent Slide)
5. Study of ultra structure of chromosome.
6. Study of different types of chromosomes.
7. Study of different Cell organelles: Eukaryotic Nucleus, Eukaryotic Ribosome and Endoplasmic Reticulum using charts or permanent slides
8. Study of cell cycle using chart.
9. Study of structure, procedure and type of microtome
10. Study of some important tools used in wild life: Camera, binocular, tripod, shot gun, tranquilizer, telescope/spotting scope.
11. Quantification of fauna using quadrate sampling method (calculation of density, abundance and frequency of occurrence)
12. Demonstration of census technique methods (line transect, belt transect, point count, mark capture-recapture method)
13. To map the distribution of rare and endangered animal species of Gujarat and India.
14. Study of various National Parks of Gujarat state.
15. Study of various Wildlife Sanctuaries of Gujarat state.
16. To visit any protected area (National park/Sanctuary) and prepare a report of visit.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
SKILL ENHANCEMENT COURSE CODE: SC23SECZOO106

APICULTURE

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Period/Week)	**Theory**	**External- 25 Marks** **Internal- 25 Marks**

Program Outcome:

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

Course Outcome:

1. The student shall have basic knowledge about morphology and life cycle of honey bee.
2. The student shall have basic knowledge identification and importance of honey bee in apiculture.

Sr. No			Credit	Hr
1	Unit-1	• Introduction, history and importance of apiculture. • Classification, morphology and diversity of honey bees. • Life history and social organization in honey bee. • Selection criteria of honey bee for apiculture.	1	15
2	Unit-2	• A typical bee hive (natural) • Methods of Bee Keeping – Old and Modern. • Appliances for modern method. • Products of bee keeping: Honey & Bee Wax.	1	15

Reference:

1. Economic Zoology : G. S. Shukla & V. B. Upadhyay, Rastogi Publication, Meerut.
2. Economic and Applied Entomology: Kumar and Nigum, Emkay Publication, Delhi.

Further Reading:

1. Graham, J M (1992) The hive and the honey bee. Dadant and Sons, Hamilton, IIIinois.
2.Mishra R.C. (1995) Honey bees and their management in India. ICAR Publication, Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE

FUNDAMENTALS OF ZOOLOGY-I PRACTICAL

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

Time: more than 3 Hours **Total Marks: 50**

Q 1	Prepare a temporary slide of onion root tip showing different stages of mitosis. **OR** Prepare a temporary slide of onion cells and describe the structure of cell.	**05**
Q 2	Prepare a temporary slide of Protista from given sample **OR** Prepare a temporary slide of Paramecium from given sample. **OR** Identify and describe the structure and function of given microtome	**05**
Q 3	Quantification of fauna using quadrate method	**07**
Q 4	Identify the disease and describe its cause, symptoms and cure **OR** Identify and map the distribution of rare and endangered animal species of Gujarat and India.	**05**
Q 5	**Do as directed** 1. Identify the disease and describe its cause, symptoms and cure/ types of chromosome 2. Identify and classify the specimen up to class and describe its morphological characters (Protozoa) 3. Identify and classify the specimen up to class and describe its morphological characters (Porifera) 4. Identify and classify the specimen up to class and describe its morphological characters (Cnidaria) 5. Identify and classify the specimen up to class and describe its morphological characters (Platyhelminthes) 6. Identify and classify the specimen up to class and describe its morphological characters (Nematoda)	**18**
Q 6	Viva voce and field trip report	**05**
Q 7	Journal submission	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

BASICS OF ZOOLOGY-I PRACTICAL

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 25**

Q 1	Examine the sample of pond water under microscope and show different Protists to examiner **OR** Prepare slide of Paramecium from given culture and show it to examiner	**04**
Q 2	Identify the disease and describe its cause, symptoms and cure	**03**
Q 3	Do as directed 1. Identify and classify the specimen up to class and describe its morphological characters. (Protozoa) 2. Identify and classify the specimen up to class and describe its morphological characters. (Porifera) 3. Identify and classify the specimen up to class and describe its morphological characters. (Cnidarian) 4. Identify and classify the specimen up to class and describe its morphological characters. (Platyhelminthes, Nematoda)	**12**
Q 4	Viva-voce	**03**
Q 5	Journal	**03**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MULTI DISCIPLINARY SPECIFIC COURSE

INTRODUCTION TO ZOOLOGY-I PRACTICAL

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 25**

Q 1	Prepare a temporary slide of onion root tip showing different stages of mitosis. **OR** Prepare a temporary slide of onion cells and describe the structure of cell.	**04**
Q 2	Identify and describe the use of tools or technique in wildlife biology **OR** Quantification of fauna using quadrate method	**03**
Q 3	**Do as directed** 1. Identify and describe the part of microscope 2. Identify and describe the structure and function of cell organelle/ types of chromosome 3. Identify and comment on the threats of endangered animal 4. Identify and comment on the location and fauna of National park/ sanctuary	**12**
Q 4	Viva voce and Field trip report submission	**03**
Q 5	Journal submission	**03**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Microbiology

Syllabus/ scheme

Semester – 1 to 2

With effect from

June-2023

Date: 12/08/2023 Total page: 41

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN	
B. Sc. (Zoology) Syllabus 2023 (according to NEP-2020)	
Document code	**Syllabus MB- 2021**
Name of faculty	**Science**
Faculty code	**SCI**
Programme name	**B. Sc. MICROBIOLOGY**
Programme code	**SCIUG105**
Effective from	**June-2023**

The proposed new structure for B. Sc. course is based on NEP-2020 which is in force from June-2023.

Course Pattern

1. This programme is divided into **Eight Semesters** (Four Years). The duration of an academic year consists of two semesters, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. Each semester has 22 credits and the programme is comprised of total 176 credits.
2. The theory courses with 4 credits shall have 60 hrs of direct classroom teaching workload (15 weeks × 4). The theory courses with 3 credits shall have 45 hrs of teaching workload (15 weeks × 3) and the theory courses with 2 credits shall have 30 hrs of teaching workload (15 weeks × 2).

Attendance: The attendance rules will be as per the rules and regulation of Hemchandracharya North Gujarat University, Patan.

Medium of Instruction: The medium of instruction shall be Gujarati but students are free to write answers in Gujarati or English in examination.

Language of question paper: Question paper should be drawn in English

Number of students in each batch for practical examination should be 15.

Evaluation

Continuation and Comprehensive Evaluation (CEE)

1. **For CEE of 50** marks following components shall be considered.

Sr. No.	Component	Marks
1	Daily/Weekly/Monthly unit test/ Internal exam	25
2	Assignment/ Quiz test	10
3	Development of soft skill (Seminar/ Group discussion)	05
4	Solving exercise/ Work base training/ Reading analysis	05
5	Attendance	05
	Total	**50**

2. For **CEE of 25** marks following component should be used.

Sr. No.	Component	Marks
1	Daily/Weekly/Monthly unit test/ Internal exam	15
2	Assignment/ Quiz test	05
3	Attendance	05
	Total	**25**

Semester End Evaluation (SEE)

1. For SEE of 50 marks following question paper style shall be considered.

	Total marks	
Q. 1	10	Must be drawn from Unit 1 and will have three long questions out of which any two must be answered (5 marks each)
Q. 2	10	Must be drawn from Unit 2 and will have three long questions out of which any two must be answered (5 marks each)
Q. 3	10	Must be drawn from Unit 3 and will have three long questions out of which any two must be answered (5 marks each)
Q. 4	10	Must be drawn from Unit 4 and will have three long questions out of which any two must be answered (5 marks each)
Q. 5	10	08 short questions must be drawn from all units, out of which any 05 must be answered (2 marks each)
Total	**50**	

2. For SEE of 25 marks following question paper style shall be considered.

	Total marks	
Q. 1	10	Must be drawn from Unit 1 and will have three long questions out of which any two must be answered (5 marks each)
Q. 2	10	Must be drawn from Unit 2 and will have three long questions out of which any two must be answered (5 marks each)
Q. 3	05	08 short questions must be drawn from both units, out of which any 05 must be answered (1 marks each)
Total	**25**	

PROGRAM OBJECTIVE

1. The primary objective of the program is to impart quality education in the subject of Microbiology as a basic science and its applied branches to the students.
2. To provide quality education in a branch of Biological sciences i.e., Microbiology withdifferent specializations.
3. To facilitate Higher education & research in Microbiology.
4. To provide quality education offering skill-based programs and motivate the students for self-employment in applied branches of Microbiology.
5. To inculcate the spirit of resource conservation and love for nature.
6. To conduct field studies and different projects of local and global interests.
7. To provides opportunities for professional and personal development through curricular and co- curricular activities.
8. Provide consultancy and organize extension activities.

PROGRAMME OUTCOMES

1. To understand the fundamental of microbes as well as complex microbe structure, physiology and evolution of microbes through taxonomic study.
2. For instance, if you major in microbiology, you can also still take courses from across theother complementary.
3. Apply the wide range of subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.
4. Understand the applications of biological techniques to various fields of biology.
5. When you graduate with a Bachelor of Science (microbiology) you can serve asacademician in different institutes.
6. The syllabus has been designed in such a way that it will give good experience to the student to work under pressure.

B. Sc. Semester I (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC MIC101	Fundamentals of Microbiology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC MIC102	Microbiological techniques	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC MIC103	Basic microbiology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC MIC101	Fundamentals of Microbiology PracticalPart A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Fundamentals of Microbiology PracticalPart B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC MIC102	Microbiological techniques Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC MIC103	Basic microbiology practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC MIC104	English	2	25	25	50	2	2
Value added courses	SC23VAC MIC105	To be selected from Basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC MIC106	Microbial culture preservation	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

Semester I

B. Sc. Semester I (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC MIC101	Fundamentals of Microbiology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC MIC 102	Microbiological techniques	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC MIC 103	Basic microbiology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC MIC101	Fundamentals of Microbiology PracticalPart A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Fundamentals of Microbiology PracticalPart B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC MIC102	Microbiological techniques	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC MIC103	Basic microbiology	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC MIC104	English	2	25	25	50	2	2
Value added courses	SC23VAC MIC105	To be select from Basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC MIC106	Microbial culture preservation	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCMIC101

FUNDAMENTALS OF MICROBIOLOGY

Total Credits- 04 (04 Period/Week)	**Theory**	**External-50 Marks**
		Internal- 50 Marks

Course objective

To make student familiar with microbiology as important subject, History and development of subject, Scope of microbiology in various sectors and basic introduction to microbes

Unit-I: History of Development of Microbiology

- Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming
- Role of microorganisms in fermentation, Germ theory of disease, Principle of immunization.
- Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A.Waksman, Paul Ehrlich, Elie Metchnikoff, Edward Jenner

Unit-II: Scope of Microbiology

- Distribution of microbes in nature
- Taxonomic and integrative Approaches for subdivision of microbiology, Concept of classification, major groups of microorganisms
- Applied area of Microbiology: Medical, Agriculture, Soil, water, food, Dairy, industries, veterinary, aquatic, Space, geochemical and petroleum.

Unit-III: Microscopy and Staining

- Basic Principle of microscopy, working of Light and compound microscope.
- Working principle of Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluoresence Microscope,

- Satins and staining: Dyes and stains – Definition and examples acidic & basic dyes and leuco compounds
- Principles of staining techniques for bacteria
- Types of staining: simple, negative, differential and gram staining

Unit-IV: Introduction to Microbial World

- Systems of classification Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility.
- Difference between prokaryotic and eukaryotic microorganisms
- General characteristics of Acellular microorganisms: A general introduction with special reference to the structure of the following: TMV, T4 and λ phage, one step multiplication curve

Outcomes

- ✓ Students will familiarize with Importance of microbiology,
- ✓ Understand scope of microbiology in various fields.
- ✓ Contribution of scientists in field of microbiology
- ✓ Explain various microscopic and staining techniques for observing microorganisms.

References

1. Elementary Microbiology Vol-I, H. A. Modi (2014)
2. Microbiology- Michael J Pleczar – 5th Edition
3. Principle of microbiology by Ronald M. Atlas, 2nd Edition

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER - I

PROGRAM CODE: SCIUG105

PRACTICLS: SC23 PMJDSCMIC101 PART-A & PART B

Total Credits-04	**Part A: 2 credit**	**(04 Period/Week)**	**Internal- 25 Marks**	**External-25 Marks**	**Total marks: 100**
	Part B: 2 credit	**(04 Period/Week)**	**Internal- 25 Marks**	**External-25 Marks**	

LIST OF PRASCTICALS

1. Microbiology Good Laboratory Practices and Biosafety.
2. To study the principle, working methodology and applications of important instruments (biological safety cabinets, autoclave, BOD incubator, hot air oven, pH meter) used in the microbiology laboratory
3. Preparation of standard solutions: (A) Percent solutions (B) Part dilutions (C) Molar solutions (D) Normal solutions (E) Molal solutions (F) PPM and PPB solutions
4. Study of basic principle and working components of Light microscope
5. Study of *Rhizopus*, *Penicillium*, *Aspergillus* using temporary mounts
6. Study of *Spirogyra* and *Chlamydomonas*, *Volvox* using temporary Mounts
7. Study of the following protozoans using permanent mounts/photographs: *Amoeba*, *Entamoeba*, *Paramecium* and *Plasmodium*
8. Staining techniques for bacteria – Monochrome staining using Acidic and Basic dyes
9. Study of morphology of different bacteria
10. Hanging drop technique to demonstrate Bacterial motility
11. Gram staining of bacteria
12. Study of flagella and pili staining (Loeffler's method)
13. Staining of bacterial spore
14. Study of fungal mycelia and spores
15. Study of algae under microscope
16. Staining of cell wall by Dyar's / Ringer's method
17. Capsule staining in bacteria by Hiss / Maneval's Method
18. Endospore staining by Dorner's / Snyder's method

Reference

1. Patel R.J. and Patel R.K. (2016) Experimental microbiology Volume I, 9thEdition.Aditya,
2. Patel R.J. and Patel R.K. (2017) Experimental microbiology Volume II, 9th Edition. Aditya,
3. Cappuccino J.G. (2016) Microbiology; A Laboratory Manual, 11th Edition. Pearson Edication (Singapore) Pvt. Ltd., (ISBN: 978-9332535190)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER - I

PROGRAM CODE: SCIUG105

MINOR DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCMIC102

MICROBIOLOGICAL TECHNIQUES

Total Credits- 02 (02 Period/Week)		**Theory**	**External-25 Marks**
			Internal- 25 Marks

Objective

To understand student for basic microbiology techniques

Unit-I: Microscopy Techniques

- Basic Principle of microscopy
- Types of microscopes used in microbiology
- Working principle of Light microscope and its components
- Working principle of Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope

Unit-II Bacterial staining techniques

- Satins and staining: Dyes and stains – Definition and examples acidic & basic dyes and luco compounds
- Principles of staining techniques for bacteria
- Steps in various staining process, role of intensifier and decolorisers
- Types of staining: simple, negative, differential and gram staining

Outputs

- ✓ student will understand principle and types of various microscopes
- ✓ Student will have hands on experience for operating microscope
- ✓ student will learn staining technique for observation of bacterial cells

Reference

1. Elementary Microbiology Vol-I, H. A. Modi (2014)
2. Microbiology- Michael J Pleczar – 5th Edition

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE:SC23PMIDSCMIC102

MICROBIOLOGICAL TECHNIQUES

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

LIST OF PRACTICALS

- Microbiology Good Laboratory Practices and Biosafety.
- To study the principle, working methodology and applications of important instruments (biological safety cabinets, autoclave, BOD incubator, hot air oven, pH meter) used in the microbiology laboratory
- Study of basic principle and working components of Light microscope
- Study of *Rhizopus*, *Penicillium*, *Aspergillus* using temporary mounts
- Study of *Spirogyra* and *Chlamydomonas*, *Volvox* using temporary Mounts
- Study of the following protozoans using permanent mounts/photographs: *Amoeba*, *Entamoeba*, *Paramecium* and *Plasmodium*
- Study of staining techniques for bacteria

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23MDCMIC103

BASIC MICROBIOLOGY

Total Credits- 02	**(02 Period/Week)**	**Theory**	**External-25 Marks**
			Internal- 25 Marks

Objective

To understand student about basic microbiology concept

Unit-I: Scope of Microbiology

- Distribution of microbes in nature
- Taxonomic and integrative Approaches for subdivision of microbiology, Concept of classification, major groups of microorganisms
- Applied area of Microbiology: Medical, Agriculture, Soil, water, food, Dairy, industries, veterinary, aquatic, Space, geochemical and petroleum.

Unit-II: Bacterial cell and Microscopy

- Basic structure of bacterial cell, Morphology of bacteria
- Basic Principle of microscopy, working of Light and compound microscope.
- Satins and staining: Dyes and stains – Definition and examples acidic & basic dyes and luco compounds
- Principles of staining techniques for bacteria
- Types of staining: simple, negative, differential and gram staining

Reference

1. Elementary Microbiology Vol-I, H. A. Modi (2014)
2. Microbiology- Michael J Pleczar – 5th Edition

Outputs

- ✓ Student will well verse with scope of microbiology
- ✓ Student will have hands on experience for operating microscope
- ✓ student will learn staining technique for observation of bacterial cells

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE:SC23PMDCMIC103

BASIC MICROBIOLOGY

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

LIST OF PRACTICALS

- Microbiology Good Laboratory Practices and Biosafety.
- To study the principle, working methodology and applications of important instruments (biological safety cabinets, autoclave, BOD incubator, hot air oven, pH meter) used in the microbiology laboratory
- Study of basic principle and working components of Light microscope
- Study of morphology of different bacteria
- Study of bacterial staining

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

SKILL ENHANCEMENT COURSE CODE: SC23SECMIC106

MICROBIAL CULTURE PRESERVATION

Total Credits- 02 (02 Period/Week)	**Theory**	**External- 25 Marks** **Internal- 25 Marks**

UNIT-I Preparation of media

- Different types and composition of isolation media
- Media and reagent preparation: Calculation of normality, molarities and % solution
- Methods of sample collections and its transport
- Sterilization of media and methods of sterilization

UNIT-II Pure culture and maintenance

- Pure culture techniques: Serial dilution, Double dilution, plating methods: Streaking, spreading and pouring
- Preservation of culture: sub culturing, Oil overlay, storage at low temperature,: Lyophilization and use of liquid nitrogen
- National and international culture collections and their functions

Reference

1. Elementary Microbiology Vol-I, H. A. Modi (2014)
2. Microbiology- Michael J Pleczar – 5th Edition
3. Principle of microbiology by Ronald M. Atlas, 2nd Edition

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE

FUNDAMENTALS OF MICROBIOLOGY PRACTICAL

PRACTICAL SKELETON (External Examination)

Time: more than 3 Hours **Total Marks: 50**

Q 1	Perform any one practical from list given below	**10**
Q 2	Perform any one practical from list given below	**10**
Q 3	Perform any one practical from list given below	**10**
Q 4	Spotting	**10**
Q 5	Viva voce	**05**
Q 6	Journal submission	**05**

PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE

FUNDAMENTALS OF MICROBIOLOGY PRACTICAL

PRACTICAL SKELETON (Internal Examination)

Time: 3 Hours **Total Marks: 50**

Q 1	Perform any one practical from list given below	**20**
Q 2	Perform any one practical from list given below	**10**
Q 3	Spotting	**10**
Q 4	Viva voce	**05**
Q 5	Lab. Records	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

MICROBIOLOGICAL TECHNIQUES PRACTICAL

PRACTICAL SKELETON (External Examination)

Time: 3 Hours **Total Marks: 25**

Q 1	Perform any one practical from list given below	**05**
Q 2	Perform any one practical from list given below	**05**
Q 3	Spotting	**05**
Q 4	Viva-voce	**05**
Q 5	Journal	**05**

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

MICROBIOLOGICAL TECHNIQUES PRACTICAL

PRACTICAL SKELETON (Internal Examination)

Time: 3 Hours **Total Marks: 25**

Q 1	Perform any one practical from list given below	**05**
Q 2	Perform any one practical from list given below	**05**
Q 3	Spotting	**05**
Q 4	Viva voce	**05**
Q 5	Lab. Records	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER I

PROGRAM CODE: SCIUG105

PRACTICAL MULTIDISCIPLINARY COURSE

BASIC MICROBIOLOGY PRACTICAL

PRACTICAL SKELETON (External Examination)

Time: 3 Hours **Total Marks: 25**

Q 1	Perform any one practical from list given below	**05**
Q 2	Perform any one practical from list given below	**05**
Q 3	Spotting	**05**
Q 4	Viva-voce	**05**
Q 5	Journal	**05**

PRACTICAL MULTIDISCIPLINARY COURSE

BASIC MICROBIOLOGY PRACTICAL

PRACTICAL SKELETON (Internal Examination)

Time: 3 Hours **Total Marks: 25**

Q 1	Perform any one practical from list given below	**05**
Q 2	Perform any one practical from list given below	**05**
Q 3	Spotting	**05**
Q 4	Viva voce	**05**
Q 5	Lab. Records	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN

B.Sc. Biotechnology Syllabus (New Education Policy-NEP)

Document code	**Syllabus Biotechnology NEP-2023**
Name of faculty	**Science**
Faculty code	**SCI**
Programme name	**Undergraduate (B.Sc.)**
Subject	**Biotechnology**
Programme code	**SCIUG106**
Effective from	**June-2023**

Hemchandracharya North Gujarat University,
PATAN

B.Sc. Biotechnology Syllabus

w.e.f.

from June 23-24 under NEP

About

Biotechnology is emerging subject in the biological spectrum. Biotechnology is multidisciplinary field which has major impact on our lives. The technology is known since years which involve working with cells or cell-derived molecules for various applications. It has wide range of uses and is termed "technology of hope" which impact human health, well being of other life forms and our environment. It has revolutionized diagnostics and therapeutics; however, the major challenges to the human beings have been threats posed by deadly virus infections as avian flu, Chikungunya, Ebola, Influenza A, SARS, West Nile, and the latest Zika virus. Personalized medicine is increasingly recognized in healthcare system. In this chapter, the readers would understand the applications of biotechnology in human health care system. It has also impacted the environment which is loaded by toxic compounds due to human industrialization and urbanization. Bioremediation process utilizes use of natural or recombinant organisms for the cleanup of environmental toxic pollutants. The development of insect and pest resistant crops and herbicide tolerant crops has greatly reduced the environmental load of toxic insecticides and pesticides. The increase in crop productivity for solving world food and feed problem is addressed in agricultural biotechnology. The technological advancements have focused on development of alternate, renewable, and sustainable energy sources for production of biofuels. Marine biotechnology explores the products which can be obtained from aquatic organisms. As with every research area, the field of biotechnology is associated with many ethical issues and unseen fears. These are important in defining laws governing the feasibility and approval for the conduct of particular research. Biotechnological advancement has made human life easy in all aspects of human life. Environment, health (diagnostics and treatment), agriculture, forensics, archeology, evolutionary biology and dairy are the major field where biotechnology research is driving new paths. Biotechnology is a professional and challenging field. Unlike conventional science, biotechnology nurtures creativity, innovative ideas and advanced way of learning in the students. The field opens horizons to the world. Those young minds that have no boundary limits have great scope in biotechnology.

The National Education Policy (NEP) 2020 (hereafter referred to as NEP or Policy) recognizes that higher education plays an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. It notes that "given the 21st-century requirements, quality higher education must aim to develop good, thoughtful, well-rounded, and creative individuals".

The NEP highlights certain fundamental principles that would guide both the education system at large, as well as individual educational institutions. The principles that have a direct bearing on the curricula for different levels of higher education include:

i. Recognizing, identifying, and fostering the unique capabilities of each student to promote her/his holistic development;

ii. Flexibility, so that learners can select their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests;
iii. Flexibility, so that learners can select their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests;
iv. Multidisciplinary and holistic education across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world;
v. Emphasis on conceptual understanding rather than rote learning, critical thinking to encourage logical decision-making and innovation; ethics and human & constitutional values, and life skills such as communication, teamwork, leadership, and resilience;
vi. Extensive use of technology in teaching and learning, removing language barriers, increasing access for Divyang students, and educational planning and management;
vii. Respect for diversity and respect for the local context in all curricula, pedagogy, and policy;
viii. Equity and inclusion as the cornerstone of all educational decisions to ensure that all students are able to thrive in the education system and the institutional environment are responsive to differences to ensure that high-quality education is available for all.
ix. Rootedness and pride in India, and its rich, diverse, ancient, and modern culture, languages, knowledge systems, and traditions.

University has adopted a framework with the NEP guidelines in mind. A student can enroll for undergraduate program with these instructions. A student has option for multiple entry and exit to the course. A student gets certificate after completing two semesters; a diploma after completing four semesters. Once a student completes six semesters, he earns bachelor degree. He can further continue his study for two more semesters i.e. eight semesters (Four year graduate program) study and can earn bachelor degree with honours. Student also has opportunity to study same program without or with research.

Syllabus B.Sc. (Biotechnology) Sem-I and II

Sr. No.	Course code	Study components	Instructions Hrs./week	Examination			Credit	Exam Hours
				Continuous & Comprehensive Evaluation (CCE)	Semester End Evaluation (SEE)	Total		
Semester I								
Theory Course (DSC)								
1	SC23MJDSCBIO101	Introduction to Biotechnology	04	50	50	100	4	2:30
3	SC23MIDSCBIO102	Introduction to Biotechnology	02	25	25	50	2	2:00
4	SC23MDCBIO103	Introduction to Biotechnology	02	25	25	50	2	2:00
Practical Course (PDSC)								
5	SC23PMJDSCBIO101	Introduction to Biotechnology	4 (Group A + Group B)	50	25 Group A 25 Group B	25 Group A 25 Group B	4	5:00
6	SC23PMIDSCBIO102	Introduction to Biotechnology	04	25	25	50	2	2:30
7	SC23PMDCBIO103	Introduction to Biotechnology	04	25	25	50	2	2:30
Ability Enhancement Course								
9	SC23AECBIO104	English	02	---	50	50	2	2:00
Value Added Course								
10	---	To be chosen from basket offered by university	02	---	50	50	2	2:00
Skill Enhancement Course (SEC)								
11	SC23SECBIO106	Basics of Forensic	02	---	50	100	2	2:00

		Biotechnology						
			30	200	350	550	22	
Semester II								
Theory Course (DSC)								
1	SC23MJDSCBIO201	Cell Biology	04	50	50	100	4	2:30
3	SC23MIDSCBIO202	Cell Biology	02	25	25	50	2	2:00
4	SC23MDCBIO203	Cell Biology	02	25	25	50	2	2:00
Practical Course (PDSC)								
5	SC23PMJDSCBIO201	Cell Biology	4 (Group A + Group B)	50	25 Group A 25 Group B	25 Group A 25 Group B	4	5:00
6	SC23PMIDSCBIO202	Cell Biology	04	25	25	50	2	2:30
7	SC23PMDCBIO203	Cell Biology	04	25	25	50	2	2:30
Ability Enhancement Course								
9	SC23AECBIO204	English	02	---	50	50	2	2:00
Value Added Course								
10	---	To be chosen from basket offered by university	02	---	50	50	2	2:00
Skill Enhancement Course (SEC)								
11	SC23SECBIO206	Agriculture Biotechnology	02	---	50	100	2	2:00
			30	200	350	550	22	

Examination Structure:

Major subject paper will have 50 marks theory paper. There will be total four questions. Three questions of 10 marks will be asked from each unit in Semester End Evaluation (SEE) examination (University examination). These questions will have 50% options. Fourth question will be from all units; short questions like definition etc. shall be asked.

Minor subject paper will have 25 marks theory paper. There will be three questions. Two questions from each unit will carry 10 marks. There will be 50% options. Third question will be from both units; short questions like definition etc. shall be asked.

Multidisciplinary subject will have similar paper style as for minor subject.

SEC, VAC/IKS, AEC will have SEE (university examination) only. These subjects are to be chosen from the basket offered by the university.

For Semester End Evaluation (SEE), 75% presence in all subjects and 70% presence in the subject is must.

Internal Examination:

The distribution of Continuous & Comprehensive Evaluation (CEE) (Internal Examination) for Major/ Minor/ Multidisciplinary subjects will be as below.

Written Test/ Weekly Test	45 %
Assignments/ MCQs/ Very short questions	45 %
Attendance/ Regularity written test and activity	10 %

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER I

Introduction to Biotechnology **SC23MJDSCBIO101**

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 04 (04 Periods/ Week)	**Theory**	External **50 marks**
		Internal **50 marks**

Program Outcome

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

Course Outcome

1. Course will help students in understanding basics of biotechnology and its applied areas.
2. Students will understand use of biotechnology in Agriculture sector.
3. Course targets application of biotechnology in human health care.
4. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.

Sr. No.			Credit	Hrs.
1	UNIT-1	Introduction to biotechnology Historical development in Biotechnology Areas of Biotechnology Industrial sector of Biotechnology Startup and Innovation (SSIP)	1	15
2	UNIT-2	Scope of Biotechnology in Agriculture Biotechnology and crop improvement Biopesticide Application of plant tissue culture in Agriculture	1	15
3	UNIT-3	Role of biotechnology in health care Production of recombinant therapeutic proteins Molecular diagnosis Vaccine improvement using biotechnology	1	15
4	UNIT-4	Biotechnology in human welfare Bioremediation, Biofertilizer Application of biotechnology in forensic science	1	15

References:

1. Textbook of biotechnology by R.C. Dubay

Further Reading:

2. Principles of gene manipulation by S.B. Primrose, R.M. Twyman 6th Edition

SC23PMJDSCBIO101 Introduction to Biotechnology Practicals

Group B

1. Do's and Don'ts of Laboratory
2. Handling concentrated acids/ alkalis
3. Hazards chemicals and handling
4. Instructions and mock for primary treatment in case of accident
5. Introduction of MSDS of a chemical
6. Carcinogens and instructions on handling carcinogenic chemicals
7. Introduction to solution: Molarity, Molality and Normality.
8. Making Percent solution
9. Making Molar solution
10. Making Normal solution

Group B

11. Basic layout of Biotechnology lab
12. Introduction to sterilization/ disinfection and its importance in the laboratory
13. Introduction to SOP for instruments
14. Laminar Air Flow: architecture and handling
15. Centrifuge: architecture and handling
16. Microscope: architecture and handling
17. Autoclave: architecture and handling
18. Vis-Spectrophotometer: architecture and handling
19. Important buffers in biotechnology laboratory
20. Personal protective equipments for routine and highly pathogenic work

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER I

Introduction to Biotechnology **SC23MIDSCBIO102**

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **25 marks**
		Internal **25 marks**

Program Outcome

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

Course Outcome

1. Course will help students in understanding basics of biotechnology and its applied areas.
2. Students will understand use of biotechnology in Agriculture sector.
3. Course targets application of biotechnology in human health care.
4. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.

Sr. No.			Credit	Hrs.
1	UNIT-1	Introduction to biotechnology Historical development in Biotechnology Areas of Biotechnology Industrial sector of Biotechnology Startup and Innovation (SSIP) Scope of Biotechnology in Agriculture Biotechnology and crop improvement Biopesticide Application of plant tissue culture in Agriculture	1	15
2	UNIT-2	Role of biotechnology in health care Production of recombinant therapeutic proteins Molecular diagnosis Vaccine improvement using biotechnology Biotechnology in human welfare Bioremediation Biofertilizer Application of biotechnology in forensic science	1	15

References:

1. Textbook of biotechnology by R.C. Dubay

Further Reading:

1. Principles of gene manipulation by S.B. Primrose, R.M. Twyman 6th Edition

SC23PMIDSCBIO102 Introduction to Biotechnology Practicals

1. Do's and Don'ts of Laboratory
2. Handling concentrated acids/ alkalis
3. Hazards chemicals and handling
4. Instructions and mock for primary treatment in case of accident
5. Introduction of MSDS of a chemical
6. Carcinogens and instructions on handling carcinogenic chemicals
7. Introduction to solution: Molarity, Molality and Normality.
8. Making Percent solution
9. Making Molar solution
10. Making Normal solution
11. Basic layout of Biotechnology lab
12. Introduction to sterilization/ disinfection and its importance in the laboratory
13. Introduction to SOP for instruments
14. Laminar Air Flow: architecture and handling
15. Centrifuge: architecture and handling
16. Microscope: architecture and handling
17. Autoclave: architecture and handling
18. Vis-Spectrophotometer: architecture and handling
19. Important buffers in biotechnology laboratory
20. Personal protective equipments for routine and highly pathogenic work

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER I

Introduction to Biotechnology **SC23MDCBIO103**

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **25 marks**
		Internal **25 marks**

Program Outcome

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

Course Outcome

1. Course will help students in understanding basics of biotechnology and its applied areas.
2. Students will understand use of biotechnology in Agriculture sector.
3. Course targets application of biotechnology in human health care.
4. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.

Sr. No.			Credit	Hrs.
1	UNIT-1	Introduction to biotechnology Historical development in Biotechnology Areas of Biotechnology Industrial sector of Biotechnology Startup and Innovation (SSIP). Scope of Biotechnology in Agriculture Biotechnology and crop improvement Biopesticide	1	15
2	UNIT-2	Application of plant tissue culture in Agriculture. Role of biotechnology in health care Production of recombinant therapeutic proteins Molecular diagnosis Vaccine improvement using biotechnology Biotechnology in human welfare Bioremediation Biofertilizer Application of biotechnology in forensic science	1	15

References:

1. Textbook of biotechnology by R.C. Dubay

Further Reading:

1. Principles of gene manipulation by S.B. Primrose, R.M. Twyman 6th Edition

SC23PMDCBIO103 Introduction to Biotechnology Practicals

1. Do's and Don'ts of Laboratory
2. Handling concentrated acids/ alkalis
3. Hazards chemicals and handling
4. Instructions and mock for primary treatment in case of accident
5. Introduction of MSDS of a chemical
6. Carcinogens and instructions on handling carcinogenic chemicals
7. Introduction to solution: Molarity, Molality and Normality.
8. Making Percent solution
9. Making Molar solution
10. Making Normal solution
11. Basic layout of Biotechnology lab
12. Introduction to sterilization/ disinfection and its importance in the laboratory
13. Introduction to SOP for instruments
14. Laminar Air Flow: architecture and handling
15. Centrifuge: architecture and handling
16. Microscope: architecture and handling
17. Autoclave: architecture and handling
18. Vis-Spectrophotometer: architecture and handling
19. Important buffers in biotechnology laboratory
20. Personal protective equipments for routine and highly pathogenic work

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER I

Basics of Forensic Biotechnology **SC23SECBIO106**

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **50 marks**

Program Outcome

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

Course Outcome

1. Describe the significance of DNA profiling in various civil and criminal trials
2. Comprehend how to extract DNA from different biological materials in various conditions for forensic purposes
3. Gain in-depth knowledge of how different molecular biology techniques can be used for DNA profiling
4. Think critically and discuss the legal and ethical issues of DNA profiling in the forensic investigation process

Sr. No.			Credit	Hrs.
1	UNIT-1	Introduction and principles of forensic science, forensic science laboratory and its organization and service, tools and techniques in forensic science. Role of the toxicologist, significance of toxicological findings	1	15
2	UNIT-2	Principle of DNA fingerprinting, application of DNA profiling in forensic medicine, Investigation Tools, eDiscovery, Evidence Preservation, Search and Seizure of Computers, Introduction to Cyber security.	1	15

References:

1. Fundamentals of Biotechnology and Forensic Science by A K Shukla Amod K Singh

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. (Mathematics)

Detailed Syllabus as per NEP with Effect from July 2023

FACULTY:	**SCIENCE**
SUBJECT:	**MATHEMATICS**
PROGRAMME NAME:	**BACHELOR OF SCIENCE**
PROGRAMME CODE:	**SCIUG107**
SEMESTER:	**I to II (1st Year)**
TOTAL PAGE:	**01 TO 39 (with First Cover Page)**
DATE:	**10 August 2023**

Term	Type of Course	Mathematics Course Code	Total Units /Practical	Credit	Hrs. Per Term	External Marks (SEE)	Internal Marks (CCE)	Total Marks	External Examination Duration	Page No
Semester I	MJDSC	Paper-1	4	4	60	50	50	100	2.5Hrs	02/39
		Practical	Group A:10 Group B:10	4	120	50	50	100	Min5.0Hrs	04/39 & 06/39
	MIDSC	Paper-1	2	2	30	25	25	50	2Hrs	10/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	12/39
	MDC	Paper-1	2	2	30	25	25	50	2Hrs	14/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	16/39
	SEC	Paper-1	2	2	30	25	25	50	2.0Hrs	18/39
Semester II	MJDSC	Paper-1	4	4	60	50	50	100	2.5Hrs	20/39
		Practical	Group A:10 Group B:10	4	120	50	50	100	Min5.0Hrs	22/39 & 24/39
	MIDSC	Paper-1	2	2	30	25	25	50	2Hrs	27/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	29/39
	MDC	Paper-1	2	2	30	25	25	50	2Hrs	31/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	3134/39
	SEC	Paper-1	2	2	30	25	25	50	2.0Hrs	35/39
Sem 1 & Sem 2			Evaluation System for CCE and SEE							37/39

B.Sc. (Mathematics) SEMESTER-1 Syllabus

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Major Discipline Theory Course-1**
COURSE CODE:	**SC23MJDSCMAT101**
PAPER NAME	**Calculus and Vector Analysis**
With Effect From :	**JULY 2023**
Total Theory Credits:	**04 (04 Period /Week)**
Exam Pattern:	**50 Marks (CCE) + 50 Marks (SEE) = 100 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**

Course Outcome :	
1	**Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve Problems and real-world applications.**
2	**Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's & Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.**
3	**Understand the fundamental concepts of vector algebra, including scalar product and vector multiplication, co-planar vectors, and reciprocal vectors set.**
4	**Learn the concept of partial derivatives and vector analysis, including Understanding the properties of gradient, divergence, and curl, and Using them to solve problems.**

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	(Revision: Definition of derivative, repeat all formula of derivative) **Successive Differentiation:** Define Successive Differentiation, Derive Standard result for n^{th} derivatives and all examples for this formula for some special functions: namely, $(ax+b)^m$; $\frac{1}{ax+b}$; Log$(ax+b)$; m^{ax+b}; e^{ax+b}; $Sin(ax+b)$; $Cos(ax+b)$; e^{ax}.Cos(bx +c) ; e^{ax}.Sin(bx +c); where m $\in R$. Derive LEIBNITZ'S theorem for Successive Differentiation and its related Examples.	1	15
2	2	[Revision: Roll's Theorem & Lagrange Mean Value Theorem] **Cauchy Mean Value Theorem & Expansion of Functions:** Cauchy mean value theorem and its various forms & applications, Taylor's Theorem (without proof) and its various forms, Maclaurin's theorem and its applications, Expansion in power series of some functions like e^x, sinx, cosx, , sinhx, coshx Indeterminate Forms like $\frac{0}{0}, \frac{\infty}{\infty}, \infty-\infty, 0^0, 1^\infty, \infty^0, 0^\infty$; L'hospital's Rule for $\frac{0}{0}$ Form and $\frac{\infty}{\infty}$ Form(without proof)	1	15
3	3	[Revision: Geometry of Vector] Vector: Scalar multiplication of three and four vectors in R^3, Vector multiplication of three and four vectors in R^3,Co-planar vector of R^3, Theorems for scalar and vector Product of three and four vectors, Reciprocal Vectors Set, Theorems of Mutually Reciprocal Vectors, and examples for each of these topics.	1	15
4	4	**Partial Derivative and Vector Analysis:** Partial Derivative: Definition of partial derivative and Partial derivative of higher order and its examples. Vector Analysis: Definition of gradient, theorems of gradient and its examples, Definition of divergence, theorems of divergence and its examples, Definition of curl, theorems of Curl and its examples, Some property of gradient, divergence and curl and their examples.	1	15

References:	
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457
3	NCERT Class XII Mathematics Textbook
Further Reading:	
1	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2	Herry F. Davis, Introduction to Vector Analysis, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Major Discipline Practical Course-1 (Group A) Practical on Calculus**
COURSE CODE:	**SC23PMJDSCMAT101 (A)**
With Effect From :	**JULY 2023**
Total Practical Credits:	**02 (04 Period /Week) (Batch of 15 Students)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**

Course Outcome :	
1	**Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve problems and real-world applications.**
2	**Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's & Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.**

No.	Practical DETAILS : Group A
1	**Successive Differentiation and Standard Results (Part 1)** **Task: Define successive differentiation and demonstrate the process of finding the nth derivative of various functions, including** $(ax+b)^m, \frac{1}{ax+b}, \log(ax+b), M^{ax+b}$**. Solve examples to illustrate the application of successive differentiation in finding higher-order derivatives.**
2	**Successive Differentiation and Standard Results (Part 2)** **Task: Apply successive differentiation to derive the nth derivatives of functions such as** $e^{ax+b}, \sin(ax+b)$ **and** $\cos(ax+b)$**Provide step-by-step explanations of the derivation process and solve examples to showcase the application of these results.**
3	**Successive Differentiation and Standard Results (Part 3)** **Task: Extend the concept of successive differentiation to functions** $e^{ax}\sin(bx+c)$ **and** $e^{ax}\cos(bx+c)$**. Derive the nth derivatives of these functions and solve examples to demonstrate the application of successive differentiation in finding higher-order derivatives.**
4	**Leibnitz's Theorem for Successive differentiation (Part-1)** **Task: Apply Leibnitz's theorem for successive differentiation.**
5	**Leibnitz's Theorem for Successive differentiation(Part-2)** **Task: Apply Leibnitz's theorem for successive differentiation for parametric equations.**
6	**Cauchy Mean Value Theorem (Part-1):** **Task: Verify C.M.V. theorem is applicable or not? for functions in given interval and if possible, find value of c in respective interval.**
7	**Cauchy Mean Value Theorem (Part-2):** **Task : Application of C.M.V. theorem.**
8	**Taylor's Theorem:** **Task: To expand functions in power series using Taylor's theorem.**
9	**Maclaurin's Theorem:** **Task: To expand functions in power series using Maclaurin's theorem.**
10	**Indeterminate Forms:** **Task: To find the value of limit using L'Hospital's Rules.**

References:	
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457
3	B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd. ISBN: 978-8126558646
4	"Complex Variables and Applications" by James Ward Brown and Ruel V. Churchill ,McGraw-Hill Education ISBN: 978-0074183170
Further Reading:	
1	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2	Herry F. Davis, Introduction to Vector Analysis, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379
3	Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302
4	J. V. Deshpande, Complex Analysis, Tata McGraw- Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070587380

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Major Discipline Practical Course-1 (Group B)**
COURSE CODE:	**SC23PMJDSCMAT101 (B)**
With Effect From :	**JULY 2023**
Total Practical Credits:	**02 (04 Period /Week) (Batch of 15 Students)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

The basic requirement for the smooth and better conduction of the practical program:

1. Must require a Computer operator and a peon for better conduction of the practical and maintenance of computer systems.
2. Must have a computer lab fully equipped with Microsoft Office tools and internet facility.

Program Outcome :	
1	The B.Sc. program in Mathematics aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.
2	Upon completing the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.
3	The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.
4	Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, and algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.
Course Outcome :	
1	**Proficiency in Microsoft Word for Mathematical Writing:** • Students should be able to create and format mathematical documents using Microsoft Word, including equations, symbols, and mathematical notation. • They should understand how to use Word features to structure and organize their mathematical research papers effectively.
2	**Data Analysis with Microsoft Excel:** • Students should gain a good understanding of Excel functions and tools relevant to mathematical data analysis. • They should be able to use Excel for tasks like organizing data, generating charts, and performing basic statistical analyses.
3	**Creating Presentations with Microsoft PowerPoint:** • Students should be able to create engaging and informative presentations on mathematical topics using PowerPoint. • They should understand how to effectively use visual aids, diagrams, and graphs to communicate mathematical concepts.

No.	PRACTICAL DETAILS
Unit-1	**Microsoft Office Word Tools used in Mathematical Research**
1	**Text Basics for Math Type Equations, Text Formatting, and saving file** • Typing the text, Typing Math Type equations, Alignment of text • Editing Text: Cut, Copy, Paste, Select All, Clear • Find & Replace • New, Open, Close, Save, Save As • Formatting Text: Font Size, Font Style • Font Color, Use Bold, Italic, and Underline • Change the Text Case • Line spacing, Paragraph spacing • Shading text and paragraph • Working with Tabs and Indents **(Questions to be asked in Practical: Making a word document for the best research paper style using Math type equations, and symbols and formatting them)**
2	**Working with Objects** • Shapes, Clipart and Picture, Word Art, Smart Art • Columns and Orderings - To Add Columns to a Document • Change the Order of Objects • Page Number, Date & Time • Inserting Text boxes • Inserting Word art • Inserting symbols • Inserting Chart **(Questions to be asked in Practical: Making a Word document for the best research paper style using charts, clipart, inserting figures, and formatting them)**
3	**Working with Data Tables** • Working with Tables, Table Formatting • Table Styles • Alignment option • Merge and split option * Headers & Footers **(Questions to be asked in Practical: Making a Word document for the best research paper style using data tables, Headers, Footers page numbers with title names and formatting them)**
Unit-2	**Microsoft Office Excel Tools used in Mathematical Research**
4	**Introduction to Excel** • Introduction to Excel interface • Understanding rows and columns, Naming Cells • Working with Excel workbook and sheets • New, Open, Close, Save, Save As • Formatting Text: Font Size, Font Style • Font Color, Use Bold, Italic, and Underline • Wrap text, Merge, and Centre • Currency, Accounting, and other formats • Modifying Columns, Rows & Cells

	(Questions to be asked in Practical: Making an Excel worksheet for the given data which is to be used in a research paper and formatting them)
5	**Perform Calculations with Functions** • Creating Simple Formulas • Setting up your own formula • Date and Time Functions, Financial Functions • Logical Functions, Lookup, and Reference • Functions Mathematical Functions • Statistical Functions, Text Functions. **(Questions to be asked in Practical: Using statistical, text, and mathematical functions in Excel worksheet for the given data to obtain desired values in a mathematical format which is to be used in a research paper and formatting them)**
Unit-3	**Microsoft Office Excel Plotting Tools Used in Mathematical Research**
6	**Plotting of Graphs** • Plotting graphs of trigonometric functions • Plotting graphs of inverse trigonometric function • Plotting graphs of Polynomial equations **(Questions to be asked in Practical: Using statistical, text, and mathematical functions in Excel worksheet for the given data to obtain graphs of different types of functions which are to be used in a research paper and formatting them)**
7	**Sort and filter data** • Using number filter, Text filter • Custom filtering • Removing filters from columns • Conditional formatting **(Questions to be asked in Practical: To make an Excel worksheet for the given data to obtain graphs of different types of functions which are to be used in a research paper and formatting them)**
Unit-4	**Microsoft Office Power Point Tools Used in Mathematical Research**
8	**Introduction to PowerPoint Environment** • New, Open, Close, Save, Save As • Typing the text, Alignment of text • Formatting Text: Font Size, Font Style • Font Color, Use Bold, Italic, and Underline • Cut, Copy, Paste, Select All, Clear text • Find & Replace • Working with Tabs and Indents
9	**Creating slides and applying themes** • Inserting a new slide • Changing the layout of slides • Duplicating slides • Copying and pasting slide • Applying themes to the slide layout • Changing theme color

	• Slide background • Formatting slide background Using slide views
10	**Working with bullets and numbering** • Multilevel numbering and Bulleting • Creating List • Page bordering • Page background • Aligning text • Text directions • Columns option
11	**Working with Objects** • Shapes, Clipart and Picture, Word Art, Smart Art • Change the Order of Objects • Inserting slide header and footer • Inserting Text boxes • Inserting shapes, using quick styles • Inserting Word art • Inserting symbols • Inserting Chart **(Questions to be asked in Practical: To make a PowerPoint presentation using the word file made using the above practical and presenting it which are to be used in RDC of Ph. D.)**
References:	
1	"Excel Spreadsheet Manual for Applied Mathematics" by Stela Pudar-Hozo, Indiana University Northwest, Pearson Publication
2	"Microsoft PowerPoint 2019 Step by Step" by Joan Lambert and Joyce Cox:
3	"Microsoft Word 2019 For Dummies" by Dan Gookin:
4	"Microsoft Excel Data Analysis and Business Modeling" by Wayne L. Winston
Further Reading:	
1	"MathType Cookbook" by Richard L. Evans and W. J. “Jerry” Cody:
2	"Math into LaTeX" by George Grätzer:
3	Applied Mathematics with Microsoft Excel by Chester Piascik published by Brooks/Cole
4	Microsoft Office Book by Rouf published by Innovative Solutions

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Minor Discipline Theory Course-1**
COURSE CODE:	**SC23MIDSCMAT102**
PAPER NAME	**Introduction to Calculus**
With Effect From :	**JULY 2023**
Total Theory Credits:	**02 (02 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**
Course Outcome :	
1	**Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve Problems and real-world applications.**
2	**Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's & Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.**

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	(Revision: Definition of derivative, repeat all formula of derivative) **Successive Differentiation:** **Define Successive Differentiation, Derive Standard result for n^{th} derivatives and all examples for this formula for some special functions: namely, $(ax+b)^m$; $\frac{1}{ax+b}$; Log$(ax+b)$; m^{ax+b}; e^{ax+b}; $Sin(ax+b)$; $Cos(ax+b)$; e^{ax}.Cos(bx +c) ; e^{ax}.Sin(bx +c); where m $\in R$.** **Derive LEIBNITZ'S theorem for Successive Differentiation and its related Examples.**	1	15
2	2	[Revision: Roll's Theorem & Lagrange Mean Value Theorem] **Cauchy Mean Value Theorem & Expansion of Functions:** **Cauchy mean value theorem and its various forms & applications, Taylor's Theorem (without proof) and its various forms, Maclaurin's theorem and its applications, Expansion in power series of some functions like e^x, sinx, cosx, , sinhx, coshx** **Indeterminate Forms like $\frac{0}{0}, \frac{\infty}{\infty}, \infty-\infty, 0^0, 1^\infty, \infty^0, 0^\infty$; L'hospital's Rule for $\frac{0}{0}$ Form and $\frac{\infty}{\infty}$ Form(without proof)**	1	15

References:	
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457
3	NCERT Class XII Mathematics Textbook
Further Reading:	
1	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2	Herry F. Davis, Introduction to Vector Analysis, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Minor Discipline Practical Course-1** **Practical on Introduction to Calculus**
COURSE CODE:	**SC23PMIDSCMAT102**
With Effect From :	**JULY 2023**
Total Practical Credits:	**02 (04 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
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4	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**
Course Outcome :	
1	**Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve problems and real-world applications.**
2	**Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's & Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.**

No.	Practical DETAILS
1	**Successive Differentiation and Standard Results (Part 1)** **Task: Define successive differentiation and demonstrate the process of finding the nth derivative of various functions, including$(ax+b)^m, \frac{1}{ax+b}, \log(ax+b), M^{ax+b}$. Solve examples to illustrate the application of successive differentiation in finding higher-order derivatives.**
2	**Successive Differentiation and Standard Results (Part 2)** **Task: Apply successive differentiation to derive the nth derivatives of functions such as $e^{ax+b}, \sin(ax+b)$ and $\cos(ax+b)$Provide step-by-step explanations of the derivation process and solve examples to showcase the application of these results.**
3	**Successive Differentiation and Standard Results (Part 3)** **Task: Extend the concept of successive differentiation to functions $e^{ax}\sin(bx+c)$ and $e^{ax}\cos(bx+c)$. Derive the nth derivatives of these functions and solve examples to demonstrate the application of successive differentiation in finding higher-order derivatives.**
4	**Leibnitz's Theorem for Successive differentiation (Part-1)** **Task: Apply Leibnitz's theorem for successive differentiation.**
5	**Leibnitz's Theorem for Successive differentiation(Part-2)** **Task: Apply Leibnitz's theorem for successive differentiation for parametric equations.**
6	**Cauchy Mean Value Theorem (Part-1):** **Task: Verify C.M.V. theorem is applicable or not? for functions in given interval and if possible, find value of c in respective interval.**
7	**Cauchy Mean Value Theorem (Part-2):** **Task : Application of C.M.V. theorem.**
8	**Taylor's Theorem:** **Task: To expand functions in power series using Taylor's theorem.**
9	**Maclaurin's Theorem:** **Task: To expand functions in power series using Maclaurin's theorem.**
10	**Indeterminate Forms:** **Task: To find the value of limit using L'Hospital's Rules.**
References:	
1	**Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756**
2	**Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457**
3	**NCERT Class XII Mathematics Textbook**
Further Reading:	
1	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2	**Herry F. Davis, Introduction to Vector Analysis, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379**

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Multi-Disciplinary Theory Course-1**
COURSE CODE:	**SC23MDCMAT103**
PAPER NAME	**Mathematics-1**
With Effect From :	**JULY 2023**
Total Theory Credits:	**02 (02 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**

Course Outcome :	
1	**Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve Problems and real-world applications.**
2	**Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's & Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.**

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	(Revision: Definition of differentiation, Recall all formulas for differentiation) Successive Differentiation: Definition of Successive Differentiation, Derive formulas for n^{th} derivatives of some functions like, $(ax+b)^m$; $\frac{1}{ax+b}$; Log$(ax+b)$; m^{ax+b}; e^{ax+b}; $Sin(ax+b)$; $Cos(ax+b)$; e^{ax}.Cos(bx +c) ; e^{ax}.Sin(bx +c); where m $\in R$ and using these formulas solve related examples. Derive Leibnitz's theorem for Successive Differentiation and solve its related examples.	1	15
2	2	[Recall the Roll's Theorem & Lagrange Mean Value Theorem] Derive the Cauchy Mean Value Theorem and deduce its various forms, using these forms solve related examples. Expansion of Functions: Taylor's Theorem (without proof) and deduce its various forms, Derive Maclaurin's theorem. Applications of Taylor's & Maclaurin's expansion formulas, Expansion of e^x, sinx, cosx, , sinhx, coshxin infinite series. Know the Indeterminate Forms $\frac{0}{0}, \frac{\infty}{\infty}, \infty-\infty, 0^0, 1^\infty, \infty^0, 0^\infty$; Evaluation of limit using L'hospital's Rule for $\frac{0}{0}$ Form and $\frac{\infty}{\infty}$ Form.	1	15
References:				
1	Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756			
2	Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457			
4	NCERT Class XII Mathematics Textbook			
Further Reading:				
1	Herry F. Davis, Introduction to Vector Analysis, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379			
2	James Stewart, Calculus: Concepts and Contexts, 4th Edition, Thomson Brooks/Cole, 2018 ISBN: 978-1417687669			

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Multi-Disciplinary Practical Course-1** **Practical on Mathematics-1**
COURSE CODE:	**SC23PMDCMAT103**
With Effect From :	**JULY 2023**
Total Theory Credits:	**02 (04 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**
Course Outcome :	
1	**Develop skills in successive differentiation, including using Leibnitz's Theorem to find higher-order derivatives, and applying it to solve problems and real-world applications.**
2	**Understand the geometrical concept of Cauchy Mean Value theorem, to expand functions in power series using Taylor's & Maclaurin's Theorem, evaluate limits using L'Hospitals Rules.**

No.	Practical DETAILS
1	**Successive Differentiation and Standard Results (Part 1)** **Task: Define successive differentiation and demonstrate the process of finding the nth derivative of various functions including $(ax+b)^m$, $\frac{1}{ax+b}$, $\log(ax+b)$, M^{ax+b}. Solve examples to illustrate the application of successive differentiation in finding higher-order derivatives.**
2	**Successive Differentiation and Standard Results (Part 2)** **Task: Apply successive differentiation to derive the nth derivatives of functions such as e^{ax+b}, $\sin(ax+b)$ and $\cos(ax+b)$Provide step-by-step explanations of the derivation process and solve examples to showcase the application of these results.**
3	**Successive Differentiation and Standard Results (Part 3)** **Task: Extend the concept of successive differentiation to functions $e^{ax}\sin(bx+c)$ and $e^{ax}\cos(bx+c)$. Derive the nth derivatives of these functions and solve examples to demonstrate the application of successive differentiation in finding higher-order derivatives.**
4	**Leibnitz's Theorem for Successive differentiation (Part-1)** **Task: Apply Leibnitz's theorem for successive differentiation.**
5	**Leibnitz's Theorem for Successive differentiation(Part-2)** **Task: Apply Leibnitz's theorem for successive differentiation for parametric equations.**
6	**Cauchy Mean Value Theorem (Part-1):** **Task: Verify C.M.V. theorem is applicable or not? for functions in given interval and if possible, find value of c in respective interval.**
7	**Cauchy Mean Value Theorem (Part-2):** **Task : Application of C.M.V. theorem.**
8	**Taylor's Theorem:** **Task: To expand functions in power series using Taylor's theorem.**
9	**Maclaurin's Theorem:** **Task: To expand functions in power series using Maclaurin's theorem.**
10	**Indeterminate Forms:** **Task: To find the value of limit using L'Hospital's Rules.**
References:	
1	**Shanti Narayan, Differential Calculus, S. Chand Publishing, ISBN: 978-9352836756**
2	**Murry R. Spiegel, Vector Analysis. Schaum's Outlines, ISBN: 978-0071615457**
4	**NCERT Class XII Mathematics Textbook**
Further Reading:	
1	**Herry F. Davis, Introduction to Vector Analysis, 5th Edition, McGraw-Hill Education, ISBN: 978-0070178379**
2	**James Stewart, Calculus: Concepts and Contexts, 4th Edition, Thomson Brooks/Cole, 2018 ISBN: 978-1417687669**

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**I**
COURSE NAME:	**Skill Enhancement Theory Course-1**
COURSE CODE:	**SC23SECMAT106**
PAPER NAME	**Mathematics for Competitive Exams-1**
With Effect From :	**JULY 2023**
Total Theory Credits:	**02 (02 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**

Course Outcome :	
1	**Students get knowledge about mathematical rules, formulae and concepts for competitive examination.**
2	**Students were aware with the short tricks to solve the problems asked in competitive examination which are time consuming by its usual methods of solving them.**

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	**Number System: Numerals, Face Value and Place Value of the Digits in a Number, Types of Numbers, Operations on Numbers, Divisibility Tests Unit's Place of an Expression** **Number Series: Types of Series, Types of Questions Asked on Number Series** **HCF and LCM: Factors and Multiples, Least Common Multiple (LCM), Highest Common Factor(HCF), Method to Calculate LCM and HCF of Fractions, Method to Solve Questions Based on Bells**	1	15
2	2	**Square Root and Cube Root: Square, Square Root, Properties of Squares and Square Roots, Short Cut Techniques, Cube, Cube Root, Properties of Cube and Cube Roots** **Indices and Surds: Indices, Surds, Properties of surds, Operations on Surds, Short Cut Techniques.**	1	15
References:				
1	**Rajesh Verma, Fast Track objective Arithmetic, Arihant Publication India Ltd.**			
2	**Dr. R. S. Agrawal, Quantitative Aptitude, S. Chand Publication India Ltd.**			
Further Reading:				
1	**Satish Kumar, Maths in Moments, Arihant Publication India Ltd.**			
2	**Abhinay Sharma, Competitive Mathematics, Kiran Institute of Career Excellence.**			
3	જગદીશ પટેલ, લિબર્ટી સહાયક, લિબર્ટી કેરિયર એકેડેમી.			

હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.–૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

Email : regi@ngu.ac.in Website : www.ngu.ac.in

રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦

પરિપત્ર નં.- ૨૭૭ /૨૦૨૩

વિષયઃ વિજ્ઞાન વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના સેમેસ્ટર-૧ અને ૨ના જૂન ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવતા અભ્યાસક્રમ / પરિક્ષા સ્કીમ અંગે.

આ યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા અંતર્ગત વિષયોના સ્નાતક વિભાગો તથા સંલગ્ન વિજ્ઞાન વિદ્યાશાખાની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, એકેડેમિક કાઉન્સિલની તારીખઃ ૧૪/૦૮/૨૦૨૩ની મળેલ સભાના નિર્દિષ્ટ ઠરાવોથી રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦ અંતર્ગત UGCની Guideline તથા રાજય સરકારશ્રીના શિક્ષણ વિભાગના તારીખઃ ૧૧/૦૭/૨૦૨૩ના ઠરાવ નં.કે.સી.જી./એડમીન/૨૦૨૩-૨૪/૦૬૦૭/ખ-૧ થી પ્રકાશિત કરેલ કોમન કરિકયુલમ એન્ડ ક્રેડિટ ફ્રેમવર્ક હેઠળ ક્રેડિટ માળખું તથા પ્રકાશિત કરેલ સ્ટાન્ડર્ડ ઓપરેટીંગ પ્રોસિજર (S.O.P.) મુજબ વિજ્ઞાન વિદ્યાશાખા હેઠળના નીચેના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો શૈક્ષણિક વર્ષઃ ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવે તે રીતે મંજુર કરેલ છે, જેનો અમલ કરવા સારૂ સબંધિતોને આ સાથે મોકલવામાં આવે છે.

ક્રમ નં	અભ્યાસક્રમ	ઠરાવ ક્રમાંક	સેમેસ્ટર
૧	બી.એસ.સી. (ગણિતશાસ્ત્ર)	૧૯	સેમેસ્ટર ૧ અને ૨
૨	બી.એસ.સી. (વનસ્પતિશાસ્ત્ર)	૨૦	સેમેસ્ટર ૧ અને ૨
૩	બી.એસ.સી. (બાયોટેકનોલોજી)	૨૧	સેમેસ્ટર ૧ અને ૨
૪	બી.એસ.સી. (ભૌતિકશાસ્ત્ર)	૨૨	સેમેસ્ટર ૧ અને ૨
૫	બી.એસ.સી. (ઝુલોજી)	૨૩	સેમેસ્ટર ૧ અને ૨
૬	બી.એસ.સી. (રસાયણશાસ્ત્ર)	૩૨	સેમેસ્ટર ૧ અને ૨

સદર બાબતની જાણ આપના સ્તરેથી અધ્યાપકશ્રીઓ તથા વિદ્યાર્થીઓને કરવા વિનંતી છે.

નોંધઃ

(૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજના / ડિપાર્ટમેન્ટના ગ્રંથાલયમાં મૂકવાની રહેશે.

(૨) આ પરિપત્ર યુનિવર્સિટીની વેબસાઇટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરવામાં આવેલ છે. આથી સંબંધિત કોલેજોને ડાઉનલોડ કરી ઉપયોગ કરવા સારૂ જણાવવામાં આવે છે.

(૩) <u>વિજ્ઞાન વિદ્યાશાખા</u> વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના પ્રોગ્રામ્સના અભ્યાસક્રમોનો પરિપત્ર નં.૧૩૦/૨૦૨૩, તારીખઃ૨૩/૦૬/૨૦૨૩ રદ કરવામાં આવે છે.

બિડાણઃ ઉપરમુજબ

કા. કુલસચિવ

નં-એકે/અ×સ/૩૨૬૪/૨૦૨૩

તારીખઃ૩૧/૦૮/૨૦૨૩

પ્રતિ,

૧. ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા તરફ.
૨. વિજ્ઞાન વિદ્યાશાખા હેઠળની કોલેજોના આચાર્યશ્રીઓ તરફ
૩. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૪. ગ્રંથપાલશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૫. માન.કુલપતિશ્રી/કુલસચિવશ્રીનું કાર્યાલય હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૬. સિસ્ટમ એનાલીસ્ટશ્રી, કોમ્પ્યુટર (રીઝલ્ટ સેન્ટર) હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ.(વેબસાઇટ પર મુકવા સારૂ)
૭. પ્રવેશ પ્ર-શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ
૮. મહેકમ શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ.(૨ નકલ)

Curriculum and Credit Framework For SEM I and II
Asper UGC Guideline
(According to NATIONAL EDUCATION POLICY (NEP) – 2020)

Submittedon21st July 2023

Introduction:

The UniversityGrantsCommission (UGC)hasinitiatedseveralmeasuresto bringequity,efficiency and excellence in the Higher Education System of country. The important measurestaken to enhance academic standards and quality in higher education include innovation andimprovements in curriculum, teaching-learning process, examination and evaluation systems,besidesgovernanceandothermatters.

The UGC has formulated various regulations and guidelines from time to time to improve thehighereducationsystemandmaintainminimumstandardsandqualityacrosstheHigherEducational Institutions (HEIs) in India.The academic reformsrecommended by the UGCinthe recent past have led to overall improvementin the higher education system.However,dueto lot of diversity in the system of higher education, there are multiple approaches followed byuniversitiestowardsexamination,evaluation and grading system.While the HEIsmusthavethe flexibility and freedom in designing the examination and evaluationmethodsthat bestfitsthe curriculum,syllabi and teaching–learning methods,there is aneed to devise asensiblesystemforawardingthegradesbasedontheperformanceofstudents.

The National Education Policy (NEP)2020(hereafterreferred to as NEP or Policy)recognizesthathighereducation plays an extremelyimportantrole in promoting human aswellassocietalwell-beingandindevelopingIndiaasenvisionedinitsConstitution-ademocratic, just, socially conscious, cultured, and humane nation upholding liberty, equality,fraternity, andjusticefor all. It notes that "giventhe 21st-centuryrequirements,qualityhighereducationmustaimtodevelopgood,thoughtful,well-rounded,andcreativeindividuals". In accordance with the NEP2020, the UGC hasformulatedanewstudent-centric"CurriculumandCreditFrameworkforUndergraduateProgrammes(CCFUP)"incorporating a flexible choice-based credit system, multidisciplinary approach, and multipleentry and exit options. This will facilitate students to pursue their career path by choosing thesubject/fieldoftheirinterest.Thegradingsystemisconsideredtobebetterthantheconventional marks system and hence it has been followed in the top institutions in India andabroad. Soitisdesirable tointroduceuniform gradingsystem. This willfacilitate studentmobilityacrossinstitutionswithinandacrosscountriesandalsoenablepotentialemployersto assessthe performance ofstudents. To bringin the desired uniformity,in grading systemandmethodforcomputingthecumulativegradepointaverage(CGPA)basedontheperformanceofstudentsintheexaminations,theUGChasformulatedtheseguidelines.

NEP-2020

NEP,2020 aimsat a new and forward-looking Vision forIndia'sHigherEducation System.Thiscurriculum framework forthe bachelor-level program in PHYSICSisdeveloped keepingin view of the student centric learning pedagogy, which is entirely multidisciplinary outcome-orientedandcuriosity-driven.Toavoidrote-learningapproachandfosterimagination,thecurriculumismoreleanedtowardsself-discoveryofconcepts.Thecurriculumframeworkfocuses on pragmatist approach whereby practical application of theoretical concepts is taughtwithsubstantialcoverageofpracticalandfieldworks.

Theplatformaimsatequippingthegraduateswithnecessaryskillsfor PHYSICS-

relatedcareers,careerswithgeneralgraduate-level aptitudeandforhighereducationinPHYSICS.Augmentedinthisframeworkaregraduateattributesincludingcriticalthinking,basicpsychology,scientificreasoning,moralethicalreasoningandsoon.

Learningoutcomesforthetwoprogrammestheseframeworkshavebeendeveloped,learning outcomes for individual courses, pedagogical methods and assessment methods. Looking at allthese new concepts and progress,the detailed syllabus ofB.Sc.(Honours)–PHYSICShasbeendesignedanddecidedtobeimplementedfromtheacademicsessionfromJune 2023-24.

PROGRAMMESPECIFICOUTCOMESTOBEATTAINEDATTHEENDOFTHEPROGRAMME

AccordingtoGuidelineofNEP2020,theBoardofStudiesinPhysicsrecognizesthatcurriculum,course contentand assessmentofscholasticachievementsplay important rolesin shapingeducation.The committee isof the view thatassessmentshouldsupportandencourage the broad instructional goals such as basic knowledge of the discipline of Physicsincludingphenomenology,theoriesand techniques,conceptsandgeneral principles.Thisshould alsosupportthe abilityto ask subjective questionsand to obtainitssolutionsby useof qualitative andquantitative reasoning and by experimental investigation.Withthisinmind, we aim to provide a firm foundation in every aspect of Physics ranging from a broadspectrum of modern trends in Physics toexperimental,computationaland mathematicalskillsof students.Hence, theUG(B.Sc.)syllabihasbeenframedinsucha waythatitbridges the gap between the plus two and PG (M.Sc.) levels of Physics by providing a morecomprehensiveandlogicalframeworkinalmostallareasofbasicPhysics.

AimsofthetheProgramme:

- TomakestudentseligibleforHigherStudiesandprofessionalcourses.
- Todeveloptheskillsrequiredtogatherinformationfromresourcesandusethem.
- Todeveloptheabilitiestoread,understandandinterpretphysicalinformation–verbal, mathematicalandgraphical.
- Toprovideanintellectuallystimulatingenvironmenttodevelopskillsandenthusiasmsofstudentstothebestoftheirpotential.
- Togiveneedbasededucationinphysicsofthehighestqualityattheundergraduatelevel.
- Tooffercoursestothechoiceofthestudents.
- To enablestudentstoperformexperimentsandinterprettheresultsofobservation,includinganassessmentofexperimentaluncertainties.
- Tomakestudentseligibleforgovernmentjob.

ObjectivesofProgramme:

Bytheendofthefirstyear(2ndsemester),thestudentsshouldhaveattainedacommonlevelinbasicofphysicstocomplementthecorefortheirfuturecoursesanddevelopedtheirexperimentalanddataanalysisskillsthroughexperimentsatlaboratories.

OUTLINEOFCHOICEBASEDCREDITSYSTEM

1. **Major Course (MJDSC):** A course, which should compulsorily be studied by a candidate as a corerequirementistermedasa***MajorDisciplinespecificcourse***.
2. **Minor discipline (MiDSC)** helps a student to gain a broader understanding beyond

themajordiscipline.

3. **Multidisciplinary Course (MDSC):** Generally,acoursewhich canbechosenfrom apool of courses and which may be very specific or specialized or advanced or supportive tothe discipline/ subject of study or which provides an extended scope or which enables anexposuretosomeotherdiscipline/subject/domainornurturesthecandidate'sproficiency/skilliscalledanElectiveCourse.
4. **Interdisciplinary Course (IDSC) Course:** Elective courses may be offered by the maindiscipline/subjectofstudyisreferredtoasDisciplineSpecificElective.The University/InstitutemayalsoofferdisciplinerelatedElectivecoursesofinterdisciplinarynature(tobeofferedbymaindiscipline/subjectofstudy).
5. **Ability Enhancement Courses (AEC):** Environmental Science, English Communication/MILCommunication aremandatoryforalldisciplines.
6. **SkillEnhancementCourses(SEC):**
   Thesecoursesmaybechosenfromapoolofcoursesdesignedtoprovidevalue-basedand/orskill-basedinstruction.
7. **ValueAddedCourses(VAC):**
   Thesecoursesmaybechosenfromapoolofcoursesdesignedtoprovidevalue-basededucation course instruction.
   The Proposed new course sinchemistry forunder graduate class esare reassignedin accordance to semester/CBCS/Grading system with new education policy.The new course is based on model curriculum of the university grants commission.

COURSES/ACTIVITIESUNDERTHEPROGRAM:

1. **Lecture courses**: Courses involving lectures relating to a field or discipline by an expertor qualifiedpersonnelinafieldoflearning,work/vocation,orprofessionalpractice.
2. **Tutorialcourses:**Coursesinvolving problem-solving and discussionsrelating to afieldordisciplineundertheguidanceofqualifiedpersonnelinafieldoflearning,work/vocation,orprofessionalpractice.
3. **Practicum or Laboratory work:** A course requiring students to participate in a project orpractical or lab activity that appliespreviously learned/studied principles/theory related tothe chosen field of learning,work/vocation,orprofessional practice underthe supervisionof an expert or qualified individual in the field of learning, work/vocation or professionalpractice
4. **Seminar:**Acourserequiringstudentstoparticipateinstructureddiscussion/conversationordebate focused on assigned tasks/readings,currentorhistorical events, orsharedexperiencesguidedorledbyanexpertorqualifiedpersonnelinafieldoflearning,work/vocation,orprofessionalpractice.
5. **Internship:** A course requiring students to participate in a professional activity or workexperience,orcooperativeeducationactivitywithanentityexternaltotheeducationinstitution, normally under the supervision of an expert of the given external entity. A keyaspectoftheinternshipisinductionintoactualworksituations.Internshipsinvolveworking with local industry, government or private organizations, business organizations,artists, crafts persons, and similar entities to provide opportunities for students to activelyengageinon-siteexperientiallearning.
6. **Studio activities:** Studio activities involve the engagement of studentsincreativeorartistic

activities. Every student is engaged in performing a creative activity to obtain aspecific outcome. Studio-based activitiesinvolve visual- or aestheticfocused experientialwork.

7. **Fieldpractice/projects:**Coursesrequiringstudentstoparticipateinfield-basedlearning/projectsgenerallyunderthesupervisionof anexpertof thegivenexternalentity.
8. **Community engagement and service:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given externalentity.The curricularcomponentof 'communityengagementandservice'willinvolveactivities that would expose students to the socio-economic issues in society so that thetheoretical learning'scan be supplemented by actuallife experiencesto generate solutionstoreal-lifeproblems.

SILENT FEATURES:

- B.Sc. (Honours) Physics in UG Programme - Semester I and II shall be offered from theAcademicyear,June2023.
- Physicssubjectin the Universities/Affiliated Collegesshall offerundergraduate programmeinFacultyofSciencefromtheAcademicyear2023-24.
- ❖ A student will have to get enrolled a Discipline Specific Core Course (DSC) depending uponhis/her requirement of a degree in the said discipline of study. A student will have a choice ofselecting an Inter/MultidisciplinaryCourse(IDC/MDC),AbilityEnhancementCourse(AEC),SkillEnhancementCourse(SEC)aswellasValueAddedCourse(VAC)fromapoolofcourses.
- Eachcourse shallbe assignedaspecificnumberofCredits.
- Discipline SpecificCore Course(DSC) is the course which shouldcompulsorily be studiedby a candidate as a Major and Minor requirement so as to get degree in a said discipline ofstudy.
- There shall be One Major(MDSC) and Minor(MiDSC) Compulsory course (Theory)eachwith3creditineachsemesterandtheirpractical'seachwith2credit.
- One IDC/MDC course shall have to be offered. The credit weight-age for MD shall be of 2 creditineachsemesterandtheirpractical'seachwith2credit.
- In addition to the Major/Minorcourse,astudent willhave to choose IDC/MDC,AEC, SECaswellasVACfromapoolofcourses.
- SEC and VAC courses shall have to be offered. The credit weight-age for SEC shall be of 2 creditsandVACcourseshallbeof2credit.
- One AEC(Languages)course shall have to be offered.The creditweight-age forAbilityEnhancementCourse(AEC)shallbeof02credit.
- EachcourseshallhaveauniqueCoursecode.TheDisciplineSpecificCoreCourse,Inter/Multi-Disciplinary Course, Ability Enhancement Course, ValueAddedCourse andSkillEnhancementCourseshallbeabbreviatedrespectivelyas**DSC(Major/Minor),IDC/MDC,AEC,VACandSEC.**
    1. DisciplineSpecificCoreCourse**DSC(Major/Minor),** PracticalDiscipline SpecificCore Course**PDSC**
    2. Inter/Multi-Disciplinary Course**IDC/MDC,** PracticalInter/Multi-DisciplinaryCourse**PIDC/PMDC**
    3. AbilityEnhancementCourse(Languages)**AEC**
    4. ValueAddedCourse**VAC**
    5. SkillEnhancementCourse**SEC**
- EachAcademicyearshallconsistof**two**semesters,eachof**15weeks**ofteachingequivalentto **90 working days**. The Odd semester period shall be from **July to November** and the Evensemesterperiodshallbefrom**DecembertoApril**.
- The coursewith**4credit**shallbeof**60Hours**(15weeksx4credits)duration,
- Thecoursewith**3credit**shallbeof**45Hours**(15weeksx3credits)durationand

- Thecoursewith**2credit**shall beof**30Hours**(15weeksx2credits)duration.
- **Practicalwith2Credit**shallbeof**60Hours**(15weeksx4hours)duration.
- **Practicalwith4 Credit**shallbeof 120**Hours**(15weeksx8hours)duration.

ATTENDANCE:

The attendance rules asper the norms of Hemchandracharya North Gujarat University,Patan.

MEDIUMOFINSTRUCTION:

TheMediumofInstructionshallbeof**Gujarati medium**. Studentisfree towriteanswerseitherin**Gujarati**and/or**English**language.

TEACHINGLEARNINGPROCESS:

Teachingandlearninginthisprogrammeinvolveclassroomlecturesaswelltutorials. Itallows-

- ❖ Thetutorialsallowacloserinteractionbetweenthe studentsandtheteacheraseachstudentgetsindividualattention.
- ❖ Writtenassignmentsandprojectssubmittedbystudents
- ❖ Project-basedlearning
- ❖ Groupdiscussion
- ❖ Homeassignments
- ❖ Quizzesand ClassTests
- ❖ PPTpresentations,Seminars,interactivesessions
- ❖ Diversitysurvey
- ❖ Co-curricularactivityetc.
- ❖ IndustrialTourorFieldvisit

LANGUAGEOFQUESTIONNPAPER:

Questionpapershouldbedrawnin**Gujarati**languageandits**English**versionshouldbegiven.

EVALUATIONMETHOD :

Academic performance in various courses *i.e.* **MJDSC, MIDSC, IDC/MDC,AEC, VAC** and **SEC** are to beconsideredas parameters forassessing the achievementof students inthe PHYSICS subject.Anumber of appropriate assessment methodsofPHYSICSwillbe used to determine the extent towhichstudentsdemonstratedesiredlearningoutcomes

Followingassessmentmethodologyshouldbeadopted:

- Theoralandwrittenexaminations(Scheduledandsurprisetests),
- Closed-bookandopen-booktests,
- Problem-solvingexercises,
- Practicalassignmentsandlaboratoryreports,
- Observationofpractical skills,
- Individualandgroupprojectreports,
- Efficientdeliveryusingseminarpresentations,
- Vivavoceinterviewsaremajorlyadoptedassessmentmethodsforthiscurriculum.
- The computerized adaptivetesting,literaturesurveysandevaluations,peersandself-assessment,outputsformindividualandcollaborativeworkarealsootherimportantapproachesforassessmentpurposes.
- AstudentshallbeevaluatedthroughComprehensive Continuous Assessment(**CCA**)/(***InternalEvaluation***)aswellastheEndofSemester **E xamination**(SEE ***ExternalEvaluation***).Theweight-ageofCCAshallbe50%,whereastheweight-

ageoftheSemesterendexaminationshallbe50%.Therewillbe**nointernalevaluationin practicalcourses.**

- InSemesterassessment(**CCA**)/(**InternalEvaluation**)isspreadthrough thedurationofthecourseandistobedonebytheTeacherteachingthecourse.BoSofthes ubjectswilldecidevariouscriteriaandtheirweight-ageforCCA.Theassessmentistobedonebyvariousmeansincluding:
    - Written Tests,MCQsbasedTests/Quiz
    - Presentations/Seminars
    - Groupdiscussions/Groupactivities
    - Assignmentsetc.,Projectwork/Fieldwork

Sr No	Assessment	4 Credit Course Marks	2 Credit Course Marks
1	CCE (50%) Classroom and Internal Evaluation	50	25
2	SEE Semester End Exam (50%)	50	25
Total		100	50

- ThedistributionofInternalEvaluation CEEisgivenaspercriteriagivenbelowfor15Marks.

WrittenTest/Weekly (2 Test Best out of 3)	20Marks
Quiz (2 Test Best out of 3)	10 Marks
Active Learning During whole Term	10 Marks
Home Assignments	05Marks
Attendance-Regularityin Learning, WrittenTestandActivity	05Marks
Total CEE	50 Marks

- **SCHEMEOFASSESMENTin Uni.ExaminationforEachPractical**

No.	Nameofthehead	Marks
1.	Understandingandapproachtotheexperiment,circuitlayout,use of apparatus	05
2.	Tabulationwithcorrectunitsandaccuracy ofreading,whichisread andnotedbythestudentandverifiedbyexaminer.	05
3.	OralquestionsRegardingtheexperiment(Viva)	07
4.	Calculationsbycorrectformulaandgraphwithscale.	05
5.	Accuracyoftheresultasjudgedbycomparingthestudentsresults withthosesuppliedbyexpertassistantwhohassettheexperiment.	01
6.	Marksforjournal.	02
Total		25

Therewill be two group of practicalseach of 2 credit and 1 credit = 25 Marks, Total Marks of both Group will be 100. Students have must attend both group of practical in practical examination.

- The**Endof Semesterexamination**(***ExternalEvaluation***)shallhavean assessmentbaseduponfollowingperspectivewithrespecttoallthecourses:
    - EvaluationwithrespecttoKnowledge,
    - EvaluationwithrespecttoUnderstanding,
    - EvaluationwithrespecttoSkill,

- EvaluationwithrespecttoApplicationand
- HigherOrderThinkingSkills.

- Withrespecttoalltheabovecomponents,thereshallbefollowingtypesofQuestionsfromeachunitofthecourse.
  - MCQs/Fillintheblanks/Matchthepairs,etc
  - Shortanswerquestions
  - Mediumanswerquestions
  - Longanswerquestions, Examples/Problems,etc.

- **CERTIFIED JOURNAL:**
  TheEndofSemesterExaminationwillbeconductedbytheUniversity.A***certifiedjournal***of therespectivepracticalcourse**mustbeproduced**atthe timeofpracticalexaminationbythestudent.

- Itwillbecompulsory foracandidate to obtain ***passingpercentage***in bothInternal aswellasExternalEvaluation.Thepassingmarksforeachcourseshallbe**40%**asdecided byconcernBoardofStudiesinPhysics.

- Promotion,Re-AdmissionandTimeforCompletionofCourse, Procedure forAwardingGrades,ProvisionforAppeal,etc.asdecidedbytheHemchandrachary aNorthGujaratUniversity.

AwardingCertificates,DiplomasandDegrees:

CertificateinScience:

Students who opt to exit after completion of the first year and have secured 48 credits will beawarded the Certificate in Science with the three disciplines chosen by student in the first year.Thus, for example, if a studentof B.Sc. program with Physicsas the Major discipline and MathsastheminordisciplinesandChemistryasinterdisciplinesoptstoexitaftersuccessfulcompletion of the firstyear, the studentwill be awarded *"Certificate in Science with Physics,MathsandChemistry".*

DiplomaofScience:

Students who opt to exit after completion of the second year and have secured 92 credits will beawarded the Diploma of Science in the principal discipline.Thus, for example,if a student ofB.Sc.program with Physicsas theMajordisciplineoptsto exitaftersuccessful completionoftwoyears,thestudentwillbeawarded*"DiplomaofScienceinPhysics".*

BachelorofScience:

Students who opts to exit after completion of the third year and have secured 132 credits will beawardedtheBachelorofScienceintheMajor(principal)discipline.

BachelorofScience(Honors):

Studentsof4-yearB.Sc.programwhosuccessfullycomplete4years,withoutarigorousresearch project/ dissertation will be awarded the Bachelorof Science (Honors) in the Majordiscipline(principaldiscipline).

BachelorofScience(HonorswithResearch):

Students of 4-year B.Sc. program who successfully complete 4 years, with a rigorous

researchproject/dissertationwillbe awarded the BachelorofScience (Honors with research)in theMajordiscipline(principaldiscipline).

- **Note:**During the preparation of this curriculum, ample care is taken for consideration of thefollowings:
  (a) NEP-2020
  (b) ModelcurriculumofU.G.C.
  (c) National CreditFrameworkReportofUGC,2023
  (d) Conceptofcontinuousevaluation
  (e) CGPA (CumulativeGradePointAverageCredit)
  (f) CBCS(Choice BasedCreditSystem)
  (g) Semesterapproach
  (h) RevisedrulesandregulationofHemchandracharyaNorthGujaratUniversity,Patan.

  Thereshallbecoverageofmaximum30%syllabusthroughonlinemodeofteaching.AsperdirectivesofUGC.

Arrangement of credit Distribution Framework for three/four years Honours/Honours with Research Degree Programme with Multiple Entry and Exits options for all the institutions:

OPTION I BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
NCrF Credit Level	Semester	Major (Core) (68/88)	Minor (Electives) (32)	Multi/Inter-disciplinary (12)	AEC (10)	SEC/ Internship (12)	VAC/ IKS (8)	RP/ OJT	Total Credit/ Sem. (144/176)	Qualification / Certificate
4.5 1st Year	I	8	4	4	2	2 (SEC)	2 (IKS)	-	22	**UG Certificate**
	II	8	4	4	2	2 (SEC)	2	-	22	
First Year Total Credits		**16**	**8**	**8**	**4**	**4**	**4**	**-**	**44**	
Exit1: Award of UG certificate in Major course with 44 credits with additional 4credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor										
5.0 2nd Year	III	12	-	4	2	2 (SEC)	2 (IKS)	-	22	**UG Diploma**
	IV	12	4	-	2	2 (SEC)	2 (VAC)	-	22	
Second Year Total Credits		**40**	**12**	**12**	**8**	**8**	**8**	**-**	**88**	
Exit 2 : Award of UG Diploma in Major course with 88 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor										
5.5 3rd Year	V	12	8	-	-	2 (SEC)	-	-	22	**UG Degree**
	VI	12	4	-	2	4(Internship)	-	-	22	
Third Year Total Credits		**64**	**24**	**12**	**10**	**14**	**8**	**-**	**132**	
Award of UG Degree in Major course with 132 credits and Internship in core discipline OR continue with Major and Minor course for next NCrF credit level										
6.0 4thYear	VII	12	4	-	-	-	-	6 (OJT)	22	**UG Honours Degree**
	VIII	12	4	-	-	-	-	6 (OJT)	22	
Fourth Year Total Credits		**88**	**32**	**12**	**10**	**14**	**8**	**12**	**176**	
Award of UG Honours Degree in Major (without Research)course with total 176 credits										
OPTION II BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
6.0	VII	12	4	-	-	-	-	6 (RP)	22	**UG Honours with Research Degree**
	VIII	12	4	-	-	-	-	6 (RP)	22	
Fourth Year Total Credits		**88**	**32**	**12**	**10**	**14**	**8**	**12**	**176**	
Award of UG Honours with Research Degree in Major course with total 176 credits										

Abbreviation: AEC -Ability Enhancement Course, IKS-Indian Knowledge System, NCrF-National Credit Framework OJT-On-the-Job Training, VAC-Value Added Course, SEC-Skills Enhancement Course, RP- Research Project

GeneralCredit-SubjectStructure and Examination Pattern /MarkingSchemeofstudy componentsalongwith22creditsinB.Sc.PHYSICS SEM – 1 and 2 are as below.

Sr. No.	Course Code	StudyComponents	InstructionHrs/	Examination			Credit	Exam Duration(Ho
				Internal	Uni .Exam	Total		
SEMESTER–I PROGRAMCODE:SCIUG101								
TheoryCourse(DSC)								
1	SC23MJDSCPHY101	Major-1:DisciplineSpecificCoreCourse	04	50	50	100	4	02:30
2	SC23MIDSCPHY102	Minor:DisciplineSpecificCore Course	02	25	25	50	2	02:00
3	SC23MDCPHY103	Inter/MultiDisciplinary Courses	02	25	25	50	2	02:00
PracticalCourse(PDSC)								
4	SC23PMJDSCPHY101(A)	Major:DisciplineSpecificCoreCourses	04	25	25	50	2	2:30
5	SC23PMJDSCPHY101(B)	Major:DisciplineSpecificCoreCourse	04	25	25	50	2	2:30
6	SC23PMIDSCPHY102	Minor: Discipline SpecificCoreCourse	04	25	25	50	2	2:30
7	SC23PMDCPHY103	Inter/MultiDisciplinary Course	04	25	25	50	2	2:30
AbilityEnhancementCourses(AEC)								
8	SC23AECPHY104	(AEC)(Languages)	02	25	25	50	2	1:30
ValueAdded Course(VAC)								
09	SC23VACPHY105	ValueAddedCourses(VAC)	02	25	25	50	2	1:30
SkillEnhancementCourse								
10	SC23SECPHY106 &106(A)	**SkillEnhancementCourse(SEC)**	02	25	25	50	2	1:30
Total			30	275	275	550	22	

SEMESTER–IIPROGRAMME CODE : SCIUG101

Sr. No.	CourseCode	StudyComponents	InstructionHrs/w	Examination			Credit	Exam Duration(Ho
				Internal	Uni .Exam	Total		
SEMESTER– II PROGRAMCODE:SCIUG101								
TheoryCourse(DSC)								
1	SC23MJDSCPHY201	Major-1:DisciplineSpecificCoreCourse	04	50	50	100	4	02:30
2	SC23MIDSCPHY202	Minor:DisciplineSpecificCore Course	02	25	25	50	2	02:00
3	SC23MDCPHY203	Inter/MultiDisciplinary Courses	02	25	25	50	2	02:00
PracticalCourse(PDSC)								
4	SC23PMJDSCPHY201(A)	Major:DisciplineSpecificCoreCourses	04	25	25	50	2	2:30
5	SC23PMJDSCPHY201(B)	Major:DisciplineSpecificCoreCourse	04	25	25	50	2	2:30
6	SC23PMIDSCPHY202	Minor: Discipline SpecificCoreCourse	04	25	25	50	2	2:30
7	SC23PMDCPHY203	Inter/MultiDisciplinary Course	04	25	25	50	2	2:30
AbilityEnhancementCourses(AEC)								
8	SC23AECPHY204	(AEC)(Languages)	02	25	25	50	2	1:30
ValueAdded Course(VAC)								
9	SC23VACPHY205	ValueAddedCourses(VAC)	02	25	25	50	2	1:30
SkillEnhancementCourse								
10	SC23SECPH206 &206(A)	**SkillEnhancementCourse(SEC)**	02	25	25	50	2	1:30
Total			30	275	275	550	22	

Note: A student will allow to switch over minor to major course after finishing second semester. For that He/She must earn credits equal to credits of major subject during first two semesters simultaneously.

Semester	First Year B Sc Sem I & II Credit and Theory –Practical Distribution						
	DisciplineSpecificCoreCourses		Inter/Multi Disciplinary Course (4)	AbilityEnhancementCourse (Languages) (2)	ValueAddedCourse (2)	SkillEnhancement Course (2)	TotalCredit
	Major (8)	Minor (4)					
	Theory+ Practical Credit	Theory+ Practical Credit	Theory+ Practical Credit	Credit	Credit	Credit	
I	4 T + 4 P = 8 [In Practical 2 of Group A and 2 of Group B]	2 T + 2 P = 4	2 T + 2 P = 4	2 T	2 T	2 T	22
II	4 T + 4 P = 8 [In Practical 2 of Group A and 2 of Group B]	2 T + 2 P = 4	2 T + 2 P = 4	2 T	2 T	2 T	22

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–II

TYPEOFCOURSE: MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE: SCIUG101 COURSECODE: SC23MJDSCPHY201

COURSENAME: Electrostatics, Classical Mechanics, Electricity and Optics

EffectivefromJune2023UnderNEP–2020

TotalCredits: 04 TeachingHoursperWeek: 04TeachingHoursperSemester: 60	Theory	ExternalMarks-50 InternalMarks-50

Course Objective:

- To Learns the basics concepts and the law of electrostatics and electrostatic energy.
- ToLearntheconceptsofSimpleHarmonicOscillationsandcombinationofSHM.
- ToUnderstandtheconceptsofDamped&ForcedOscillationsanditsapplications
- To understands and recalls the basic concepts of DC Circuits and its functioning. Network
- theorems and principles of Network analysis.
- To develop foundation in optics. To learn the the knowledge of refraction through Lenses, Aberration and Interference
- To provide sufficient knowledge of Newton'S ring experiments and determine wavelength

Course Outcome:

After the successful completion of the course students will be able to

- Understands basics concepts of electrostatics. Learns how to determine the charge of an electron.
- LearnstheconceptsofSimpleHarmonicOscillationsandcombinationofSHM.
- UnderstandstheconceptsofDamped&ForcedOscillationsanditsapplications
- Learns basic concepts of DC Circuits, its functioning and principles of Network analysis. Also apply theorems to construct and solve electrical circuits.
- Learns the the knowledge of various type of Aberration and Interference
- Get sufficient knowledge of Newton'S ring experiments and determine wavelength

: Syllabus :

Unit No.	Content	Credit	Lect.Hrs60
Unit-1	**Electrostatics:** Gauss'slaw (4.21),Gauss'slaw inDifferential form (4.22),Gauss'slawandCoulomb'slaw(4.23),ImportantExamplesonGauss'sLaw (onlyList): when do Gauss's Law apply? (4.24) Force on the Surface of a chargedConductor(4.25),ElectrostaticsEnergyinthemediumsurroundingthecharged conductor (4.26), Millikan's Oil Drop Method for Determination ofElectronicCharge(4.29)(***RelatedExamples &Problems***) **SteadyCurrent:** MetalElectrodeinanElectrolyte (8.1),Batteryonopencircuit (8.2),Definition of EMF (8.3), Definition of Potential difference (8.4), Current andCurrent density (8.6), Conservation of chargei.e.,ContinuityEquation(8.8), Ohm's Law at a point (8.11), Wiedmann and franz law (8.13), TheRelaxationTime(8.14)(***RelatedExamples&Problems***) **BasicReference:** *ElectricityandMagnetismByK.K.Tewari(S.Chand&CompanyLtd)*	1	15
Unit-2	**Classical Mechanics:** **SimpleHarmonicOscillations**:CompositionoftwosimpleHarmonicMotions along the same direction of the same frequency(2.8), Two simpleHarmonicMotionsactuponaparticlesimultaneouslyhavingnophasedifferencebuttheydifferinfrequencybyverysmallamount(2.9), CompositionoftwosimpleHarmonicMotionsactinguponaparticlesimultaneouslyatrightanglestoeachother,sametimeperiodbutdifferentinphase(2.10),Lissajousfigures(2.11),Experimentaldeterminationof LissajousFigures(2.12b&c). (*RelatedExamples&Problems*) **Damped and Forced Oscillations:** Motion Due to a constant force (3.2), TheForceactsforshorttimeandtofinditseffect (3.3),A Particleexecuting S.H.M. is acted upon by a harmonic force Fsinpt of frequency $P/2\pi$ (3.4), Motioninaresistingmedium (3.5) (*Related Examples&Problems*) **Pendulum:**CompoundPendulumandOscillations,Barpendulum **BasicReference:** *ATextBookonOscillations,WaveandAcousticsbyM.Ghosh& D. Bhattacharya(S.Chand&CompanyLTD.)*	1	15

Unit-3	**Electricity:** **D.C.Circuits:**SimpleR-LCircuit-GrowthanddecayofcurrentHelmholtzequitation (11.24),R-C Circuit (11.25), Measurement of HighResistancebymethod ofleakage (11.26),ComparisonofcapacitiesbyDe- Sauty 'sMethod(11.27),IdealL-C.Circuit (11.28),SeriesL-C-RCircuit (changecaseonly)(11.29)(*RelatedExamples&Problems*) **Network Theorems:**Thevenin's Theorem (18.6), MaximumPowerTheorem(18.8) **A.C.Bridges**.:ACBridges (17.5)A.C.Bridgesforthemeasurementofinductances (17.6)(1)MaxwellBridge (2) AndersonBridgeA.C.Bridgeforthemeasurementof*capacitance*(17.7) (1)De Sauty'sA.CBridge(2)ScheringBridge(*RelatedExamples&Problems*) **Basic Reference:** *Electricity and Magnetism by K.K.Tewari(S. Chand&CompanyLtd)*	1	15
Unit-4	**Optics:** **RefractionThroughLenses:**IntroductionofvariousshapeofLenses,Lenses(4.2),Lensequation(4.9),Smallestseparationofobjectandrealimageina ConvexLens(4.13),DeviationbyathinLenses(4.15),PowerofLens(4.15) ,EquivalentFocalLengthoftwothinlensesSeparatedbyafinitedistance (4.17), FocalLength(4.17.1),Cardinal points(5.2) **Aberrations:** Introduction (5.1), The Achromatic Doublet (5.2.1), Monochromatic aberration (5.3), Sphericalaberration(5.3.1) (*RelatedExamples&Problems*) **Interference:** InterferenceinThinFilms (8.15),InterferenceduetoReflected light (8.16), Interference due to Transmitted light (8.17), Newton'sRings (8.23),DeterminationoftheWavelengthofSodiumLightusingNewton's Rings (8.24), Refractive index of a liquid using Newton's Rings,RefractiveindexusingGraph(8.25)(*RelatedExamples&Problems*) **BasicReference:**1)*ATextbookofOPTICSByN.Subhramanyam&Brijlal (S.ChandCo. Ltd.)* *2) Optics by Ajay Ghatak (THM Edition)* ***(For Aberration)***	1	15

Other References – Further Readings

- Electricity and Magnetism by Mahajan and Rangavala
- Electricity and Magnetism by Berkley Physics Course Voll 2
- WavesandOscillationsByN.Subhramanyam&Brijlal(VikasPubl.HouseLtd,NewDelhi)
- IntroductiontoClassicalMechanicsbyR.G.Takwale&P.S.Puranik (TataMcGraw-HillPublishingCompanyLtd.)
- ElectricalCircuitAnalysisbySonyandGupta
- NetworkAnalysisbyG.K.Mittal.(KhannaPublications)
- ElectricityandMagnetismbyD.C.Tayal
- PrincipalofOpticsbyB.KMathur(S.Chand&CompanyLtd)
- OpticsandAtomicsPhysicsbyD.P.Khandelval(HimalayaPublishinghouse)
- A Text book of Optics by N Subhramanyan and Brijalal

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B.Sc.PHYSICS-SEMESTER–II

TYPEOFCOURSE: MINOR DISCIPLINE SPECIFIC COURSE

PROGRAMMECODE: SCIUG101 COURSECODE: SC23MIDSCPHY202

COURSENAME: ELECTROSTATICS, CLASSICAL MECHANICS

EffectivefromJune2023UnderNEP–2020

TotalCredits: 02 TeachingHoursperWeek: 02TeachingHoursperSemester: 30	Theory	ExternalMarks-25 InternalMarks-25

Course Objective:

- To Learns the basics concepts and the law of electrostatics and electrostatic energy.
- ToLearntheconceptsofSimpleHarmonicOscillationsandcombinationofSHM.
- ToUnderstandtheconceptsofDamped&ForcedOscillationsanditsapplications.

Course Outcome:

After the successful completion of the course students will be able to

- Understands basics concepts of electrostatics. Learns how to determine the charge of an electron.
- LearnstheconceptsofSimpleHarmonicOscillationsandcombinationofSHM.
- UnderstandstheconceptsofDamped&ForcedOscillationsanditsapplications.

:: Syllabus ::

Unit No.	Content	Credit	Lect.Hrs30
Unit-1	**Electrostatics:** Gauss'slaw (4.21),Gauss'slaw inDifferential form (4.22),Gauss'slawandCoulomb'slaw(4.23),ImportantExamplesonGauss'sLaw (onlyList): when do Gauss's Law apply? (4.24) Force on the Surface of a chargedConductor(4.25),ElectrostaticsEnergyinthemediumsurroundingthecharged conductor (4.26), Millikan's Oil Drop Method for Determination ofElectronicCharge(4.29)(***RelatedExamples &Problems***) **SteadyCurrent:** MetalElectrodeinanElectrolyte (8.1),Batteryonopencircuit (8.2),Definition of EMF (8.3), Definition of Potential difference (8.4), Current andCurrent density (8.6), Conservation of chargei.e.,ContinuityEquation(8.8), Ohm's Law at a point (8.11), Wiedmann and franz law (8.13), TheRelaxationTime(8.14)(***RelatedExamples&Problems***) **BasicReference:** *ElectricityandMagnetismByK.K.Tewari(S.Chand&CompanyLtd)*	1	15

	Classical Mechanics: **SimpleHarmonicOscillations**:CompositionoftwosimpleHarmonicMotions along the same direction of the same frequency(2.8), Two simpleHarmonicMotionsactuponaparticlesimultaneouslyhavingnophasedifferencebuttheydifferinfrequencybyverysmallamount(2.9), CompositionoftwosimpleHarmonicMotionsactinguponaparticlesimultaneouslyatrightanglestoeachother,sametimeperiodbutdifferentinphase(2.10),Lissajousfigures(2.11),Experimentaldeterminationof LissajousFigures(2.12b&c). (*RelatedExamples&Problems*) **Damped and Forced Oscillations:** Motion Due to a constant force (3.2), TheForceactsforshorttimeandtofinditseffect (3.3),A Particleexecuting S.H.M. is acted upon by a harmonic force Fsinpt of frequency $P/_{2\pi}$ (3.4), Motioninaresistingmedium (3.5) (*Related Examples&Problems*) **Pendulum:**CompoundPendulumandOscillations,Barpendulum **BasicReference:** *ATextBookonOscillations,WaveandAcousticsbyM.Ghosh& D. Bhattacharya(S.Chand&CompanyLTD.)*	1	15

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- WavesandOscillationsByN.Subhramanyam&Brijlal(VikasPubl.HouseLtd,NewDelhi)
- IntroductiontoClassicalMechanicsbyR.G.Takwale&P.S.Puranik (TataMcGraw-HillPublishingCompanyLtd.)

HEMCHEMCHANDRACHARYANORTH GUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–II

TYPEOFCOURSE: INTER/ MULTI DISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23MDCPHY203

COURSENAME:ELECTRICITY AND OPTICS

EffectivefromJune2023UnderNEP–2020

TotalCredits:02 TeachingHoursperWeek:02TeachingHoursperSemester: 30	Theory	ExternalMarks-25 InternalMarks-25

:: Syllabus ::

Unit No.	Content	Credit	Lect.Hrs 30
Unit-1	**Electricity:** **D.C.Circuits:**SimpleR-LCircuit-GrowthanddecayofcurrentHelmholtzequitation (11.24),R-C Circuit (11.25), Measurement of HighResistancebymethod ofleakage (11.26),ComparisonofcapacitiesbyDe- Sauty 'sMethod(11.27),IdealL-C.Circuit (11.28),SeriesL-C-RCircuit (changecaseonly)(11.29)(*RelatedExamples&Problems*) **Network Theorems:**Thevenin's Theorem (18.6), MaximumPowerTheorem(18.8) **A.C.Bridges**.:ACBridges (17.5)A.C.Bridgesforthemeasurementofinductances (17.6)(1)MaxwellBridge (2) AndersonBridgeA.C.Bridgeforthemeasurementof*capacitance*(17.7) (1)De Sauty'sA.CBridge(2)ScheringBridge(*RelatedExamples&Problems*) **Basic Reference:** *Electricity and Magnetism by K.K.Tewari(S. Chand&CompanyLtd)*	1	15
Unit-2	**Optics:** **RefractionThroughLenses:**IntroductionofvariousshapeofLenses,Lenses(4.2),Lensequation(4.9),Smallestseparationofobjectandrealimageina ConvexLens(4.13),DeviationbyathinLenses(4.15),PowerofLens(4.15),EquivalentFocalLengthoftwothinlensesSeparatedbyafinitedistance (4.17), FocalLength(4.17.1),Cardinal points(5.2) **Aberrations:** Introduction (5.1), The Achromatic Doublet (5.2.1), Monochromatic aberration (5.3), Sphericalaberration(5.3.1)(*RelatedExamples&Problems*) **Interference:** InterferenceinThinFilms (8.15),InterferenceduetoReflected light (8.16), Interference due to Transmitted light (8.17), Newton'sRings (8.23),DeterminationoftheWavelengthofSodiumLightusingNewton's Rings (8.24), Refractive index of a liquid using Newton's Rings,RefractiveindexusingGraph(8.25)(*RelatedExamples&Problems*) **BasicReference:** 1)*ATextbookofOPTICSByN.Subhramanyam&Brijlal (S.ChandCo. Ltd.)* *2) Optics by Ajay Ghatak (THM Edition)* ***(For Aberration)***	1	15

Other References – Further Readings

- ElectricalCircuitAnalysisbySonyandGupta
- NetworkAnalysisbyG.K.Mittal.(KhannaPublications)
- ElectricityandMagnetismbyD.C.Tayal
- PrincipalofOpticsbyB.KMathur(S.Chand&CompanyLtd)
- OpticsandAtomicsPhysicsbyD.P.Khandelval(HimalayaPublishinghouse)
- A Text book of Optics by N Subhramanyan and Brijalal

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER– II (PRACTICALCOURSE)

PROGRAMMECODE:SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
MajorDisciplineCoreCourse(MJDSCP)	2(Group A)	SC23PMJDSC PHY201
MajorDisciplineCoreCourse(MJDSCP)	2 (Group B)	SC23PMJDSC PHY202
MinorDisciplineCoreCourse(MIDSCP)	2	SC23PMIDSC PHY203
Inter-DisciplineCoreCourse(MDSCP)	2	SC23PMDSC PHY204

TeachingHours

TeachingHoursperWeek:08 Hours for 4 Credit practical (120 Hours per Semester)
TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)

CourseObjectives:

- Togainpracticalknowledgebyapplyingtheexperimentalmethodtocorrelatewiththe Physicstheory.
- Toprovidehandsonexperiencewithequipmentsuchas,spectrometer,Pendulum,Flywheelandelectroniccircuits.
- Tolearntheusageofelectricalandopticalsystemsofvariousmeasurements.
- Toimpartpracticalknowledgebyperformingexperimentsbasedontheprinciplesoftheorycourses.
- Toprovidetraininghow toanalyzetheexperimentaldataandgraphicalanalysis.
- Todevelopintellectualcommunicationskillsanddiscussthebasicprinciplesofscientificconceptsinthegroup.

LABORATORYEXPERIMENTS Group A

MAJOR COURSE (2 Credit)

COURSECODE: **SC23PMJDSC PHY201(A)**

1. BarPendulum:Determinationof‘K’and‘g’
2. Melde’sExperiment. T/L^2 constant
3. FindoutRefractiveindexoftheprismusingspectrometer.
4. To determinetheratioofmagneticmomentsoftwomagnetsbyusingVibrational Magnetometer.
5. To determinethemagneticmomentofagivenBarmagnetusingDeflection MagnetometerinGaussAandBposition.
6. DeterminewavelengthofLASERLight.
7. NumericalAnalysis:JacobiinteractionMethod.
8. Plotting of a Graph and Error estimation on graphical plot. Linear and nonlinear graph, Logarithmic Graph Polar Graph
9. To Find the vertical distance between two points using Sextant.
10. Determine Modulus of Rigidity (Moment of Inertia) of Disk using Torsional pendulum
11. Numerical: Gauss Backward Interpolation Formula
12. Determinationof angular acceleration (α) and find MI ofaFlywheel using Formula
13. ToDeterminethevalueofCauchy’sConstantsof materialofPrism

LABORATORYEXPERIMENTS Group B

MAJOR COURSE (2 Credit)
COURSECODE: SC23PMJDSC PHY201(B)

1. Determinationofself-inductance'L'ofInductor.
2. StudyofParallelResonancewithvariable frequency and Fix capacity
3. P-NJunctiondiodeasFullWaveRectifierWithoutfilter. CalculationofPercentageofRegulation.
4. P-NJunctiondiodeasFullWaveRectifier(i)WithSeriesInductorFilter, (iii)WithShuntCapacitorFilter. CalculationofPercentageofRegulation.
5. Study of Characteristics of Tunnel Diode.
6. Studyof Series ResonancewithCapacitor variation and Fix Frequency
7. Studyof Parallel Resonancewithvariable capacitor and Fix Frequency
8. Decay of Potential across Condenser
9. LDRCharacteristics:obtainIVCharacteristicsofgivenLDRandcalculateitsresistor. (Forthreedifferentlightlevel)
10. To find the value of an unknown Inductor by using Owen's Bridge circuits
11. Measurement of Boltzmann constant using Diode.
12. PN Junction IV characteristics and Load Line analysis.
13. Study of Step Down Transformer. To determine Turn Ratio, % of Efficiency, Energy loss due to copper loss for a given transformer.

Course Outcome

Bytheendofthecourse,thestudentswillbeabletounderstand.

- ThebasicprinciplesofPhysicsrelatedtotheircoursesinthepracticalway.
- Theoperationaldetailsofspectrometer,electroniccircuitsetc.
- Theexperimentaldesignaspectstodeterminevariouspropertiesoflikegravity,qualityfactor, Refractiveindex,determinationofCauchy'sConstants,analysisofspectra,Analysisof error,determinevalueofunknownfrequencyetc.
- Theprocesstoanalyzetheobservationsandinfertheoutcomeoftheexperiments.
- Howtoanalyzetheexperimentaldataandgraphicalanalysis.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER – II (PRACTICAL COURSE)

PROGRAMMECODE: SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
MinorDisciplineCoreCourse(MIDSCP)	2	SC23PMIDSC PHY202

Teaching Hours per Week: 04 Hours for 2 Credit practical and TeachingHoursperSemester: 60 Hours

LABORATORYEXPERIMENTS

MinorDisciplineCoreCourse(MIDSCP) Practical

1. BarPendulum:Determinationof'K'and'g'
2. Melde'sExperiment. T/L^2 constant
3. FindoutRefractive Indexoftheprismusingspectrometer.
4. To determinetheratioofmagneticmomentsoftwomagnetsbyusingVibrational Magnetometer.
5. To determinethemagneticmomentofagivenBarmagnetusingDeflection MagnetometerinGaussAandBposition.
6. Numerical: Gauss Backward Interpolation Formula
7. Determinationofself-inductance'L'ofInductor.
8. StudyofparallelResonancewithvariable frequency and Fix capacity
9. P-NJunctiondiodeasFullWaveRectifier (i)Withoutfilter. (ii)WithSeriesInductorFilter, (iii)WithShuntCapacitorFilter. CalculationofPercentageofRegulation.
10. Studyof Parallel Resonancewithvariable capacitor and Fix Frequency
11. Decay of Potential across Condenser
12. Study of Step Down Transformer. To determine Turn Ratio, % of Efficiency, Energy loss due to copper loss for a given transformer.

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER – II (PRACTICALCOURSE)

PROGRAMMECODE:SCIUG101

(EffectivefromJune2023UnderNEP–2020)

TYPE OFCOURSE	CREDIT	COURSECODE
Multi Discipline CoreCourse(MDSCP)	2	SC23PMDC PHY203

TeachingHoursperWeek:04 Hours for 2 Credit practical and TeachingHoursperSemester: 60 Hours

LABORATORYEXPERIMENTS

MultiDisciplineCoreCourse(MDSCP) Practical

1. NumericalAnalysis:JacobiinteractionMethod.
2. Plotting of a Graph and Error estimation on graphical plot. Linear and nonlinear graph, Logarithmic Graph , Polar Graph
3. To Find the vertical distance between two points using Sextant.
4. Determine Modulus of Rigidity (Moment of Inertia) of Disk using Torsional pendulum
5. Numerical: Gauss Backward Interpolation Formula
6. Determinationof angular acceleration (α) and find MI ofaFlywheel using Formula
7. ToDeterminethevalueofCauchy'sConstantsof materialofPrism
8. Studyof Parallel Resonancewithvariable capacitor and Fix Frequency
9. Decay of Potential across Condenser
10. Measurement of Boltzmann constant using Diode.
11. PN Junction IV characteristics and Load Line analysis.
12. Study of Step Down Transformer. To determine Turn Ratio, % of Efficiency, Energy loss due to copper loss for a given transformer

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN
B.Sc.PHYSICS-SEMESTER–II

Type Of Course:Skill enhancement Course
Programme Code:SCIUG101
COURSE CODE:SC23SECPHY206

COURSENAME:ElectronicCircuitElementsand EnergySources
(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02T eachingHoursperSemester:30	Theor y	ExternalMarks–25 InternalMarks – 25

Unit No.	Content	Credit	Lect Hrs 30
Unit-1	**RESISTOR:**Generals (6.1),Resistortype,Wirewoundresistor,Carboncompositionresistor, Carbonfilmresistor,Cermetefilmresistor,Metalfilmresistor,Powerresistor,Valuetolerance,Variableresistor,PotentiometerandRheostats,Fusibleresistor.,Resistorcolor,resistor,Colorband,Resistorundertenohm, Resistor.Troubles,Checkingresistorwithohmmeter. **CAPACITOR:**Capacitors,Capacitorconnecttobattery,Capacitance,Factorscontrollingcapacitance,TypeofCapacitors,FixedCapacitor,Variablecapacitors,Voltageratingofcapacitors, Straycircuitcap.Leakageresistance,TroublesCapacitor,Checking capacitorwithohmmeter. **INDUCTOR:**Inductor,Comparison ofdifferent coils,Inductanceofaninductance,Anotherdefinitionofinductance,Mutualinductance, Coefficient of coupling, Variables inductors, Inductor inseriesandparallelwithoutM,Seriescombinationwithm, Strayinductance,Energystoragemagneticfield,DCResistanceofcoils.	1	15
Unit-2	**CELLS AND BATTERY:** Primary and Secondary cells and Battery's, Voltage and current of cell, Cell life, Different type of dry cells, Carbon zinc cell, Alkaline cell, Manganese alkaline cell, Nickel cadmium cell, Mercury cell, Silver oxide cell, Lead acid cell, Battery rating, Testing dry cell, Photo electric cell, Solar cell **TRANSFORMER:** Introduction, Type of Transformer, Constructionof Transformer,Transformerworking, Transformer impedance,CanaTransformerOperateonDCRFShielding,AutoTransformer	1	15
BasicReference:*BasicElectronicsbyB.L.Theraja,Pub.S.Chand&Company3rd Edition*			

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–II

TYPE OF COURSE:SKILLENHANCEMENTCOURSE

PROGRAMMECODE:SCIUG201 COURSECODE:SC23SECPHY206(A)

COURSENAME: MEASUREMENT SYSTEMS

(EffectivefromJune2023UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02TeachingHoursperSemester: 30	Theory	ExternalMarks–25 InternalMarks-25

:: Syllabus ::

Sr. No	Content	Credit	Lec. Hrs 30
Unit 1	**Instrumentation;** Measurement, Significance of measurement, Types of measurement: direct, indirect, analog, digital; Null and Detection Method; Functional block diagram of measurement system; Examples, Rudimentary Pressure Gauge; Bourdon Tube thermometer; Input-Output configuration; Desired interfacing and modifying input; General scheme; Examples; Method of corrections; Method of higher gain feedback; Signal filtering; Opposing inputs; computed correction and inherent sensitivity.	1	15
Unit 2	**Statics Characteristics:** Static calibration; Static characteristics; Accuracy & Precision; bias; Combination of Component error in overall system; Accuracy; Calculation; Addition; Subtraction; Multiplication; & Division Errors: Errors, Absolute and Relative; Types of error; Gross error; Systematic and Random error; Method of correction; Statistical analysis curve; Probable error limiting error.	1	15

Reference Book:

1) E.O. Dobelin, Measurement Systems, Mc Graw Hill,
2) A.K. Sawhney, Instrumentation,
3) Gopal Krishna Banerjee, Electrical and Electronic Measurement, PHI, New Delhi,
4) Introduction to Measurement and Instrumentation, 3" Ed, Arun K Ghose, PHI, New Delhi

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,PATAN
B.Sc.PHYSICS-SEMESTER–I&II

SemesterEndExamination (SEE)

(EffectivefromJune2023UnderNEP–2020)

FORMATFORQUESTIONPAPER4
CREDITCOURSEINPHYSICS(MAJORDISCIPLINESPECIFICCOURSE)

PROGRAMMECODE: SCIUG101

COURSECODE:SC23MJDSCPHY101or**SC23MJDSCPHY201**

Theuniversityexaminationpaperconsistsoffourquestions.

- Firstquestionisof12MarksandwillbefromUnit–I.
- SecondquestionisOf13MarksandwillbefromUnit –II.
- ThirdquestionisOf12MarksandwillbefromUnit–III.
- FourthquestionisOf13Marksandwillbefrom Unit-IV.

(1) Thisquestionpapercontainsfourquestions.Allquestionsarecompulsory. (2) Figuresatrightside indicate themarksofquestion. (3) Illustrateyouranswerwithproperfiguresanddiagram.		Marks
Que–1	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo(Application/Example/ShortNote)	08 04
Que–2	(A)AttemptanyTwooutofThree.(TheoryLongQuestions)(B)AttemptanyOneoutofTwo(Application/Example/ShortNote)	10 03
Que–3	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo.(Application/Example/ShortNote)	08 04
Que-4	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo(Application/Example/ShortNote)	10 03
	Total	50

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN
B.Sc.PHYSICS-SEMESTER–I&II

SemesterEndExamination (SEE)
(EffectivefromJune2023UnderNEP–2020)

FORMATFORQUESTIONPAPER2CREDITCOURSEINPHYSICS(MINO R AND INTERDISCIPLINERYSPECIFICCOURSE)

PROGRAMMECODE:SCIUG101

COURSE CODE:SC23MIDSCPHY103 (MINOR) or SC23MDCPHY104 (Inter/Multi)
SC23MIDSCPHY203 **(MINOR)** or SC23MDCPHY204 (Inter/Multi)

Theuniversityexaminationpaperconsistsoffourquestions.
Firstquestionisof12marksandwillbefromUnit–I.
Secondquestionisof13marksandwillbefromUnit–II.

1. Thisquestion papercontainsthree questions.Allquestionsarecompulsory. 2. Figuresatrightsideindicatethemarksofquestion. 3. Illustrateyouranswerwithproperdiagram/figure		Marks
Que–1	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo.(Example/Shortnote)	08 04
Que – 2	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo.(Example/Shortnote)	10 03
	Total	25

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–I&II

SemesterEndExamination (SEE)

(EffectivefromJune2023UnderNEP–2020)

FORMATFORQUESTIONPAPER2 CREDITCOURSEINPHYSICS

(SKILLENHANCEMENTCOURSE)

PROGRAMMECODE:SCIUG101

COURSECODE:SC23SECPHY106 or 106(A) (SEM-1)
SC23SECPHY206 or 206(A) (SEM-2)

Theuniversityexaminationpaperconsistsoffourquestions.

Firstquestionisof12marksandwillbefromUnit–I.

Secondquestionisof13marksandwillbefromUnit–II.

1. Thisquestion papercontainsthree questions.Allquestionsarecompulsory. 2. Figuresatrightsideindicatethemarksofquestion. 3. Illustrateyouranswerwithproperdiagram/figure		Marks
Que–1	A. AttemptanyTwooutofThree.(TheoryLongQuestions) B.AttemptanyOneoutofTwo.(Example/Shortnote)	08 04
Que – 2	A. AttemptanyTwooutofThree.(TheoryLongQuestions) B. AttemptanyOneoutofTwo.(Example/Shortnote)	10 03
	Total	25

ઊઠો, જાગો અને ધ્યેય પ્રાપ્તિ સુધી અવિરત પ્રયત્નશીલ રહો–સ્વામી વિવેકાનંદ

PROGRAM CODE : SCIUG102

Syllabus and Scheme of Examination

for

Sem. I and Sem. II of B.Sc. Honors Chemistry

Four-year Graduate Honors Program in Chemistry
Under NEP 2020

Submitted

to

Hemchandracharya North Gujarat University, Patan

Under

Choice Based Credit System

Implemented w.e. f June, 2023

Submitted on May, 2023
ReSubmitted on July, 2023
Resubmitted on August, 2023

PREAMBLE

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters.

The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. However, due to lot of diversity in the system of higher education, there are multiple approaches followed by universities towards examination, evaluation and grading system. While the HEIs must have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching–learning methods, there is a need to devise a sensible system for awarding the grades based on the performance of students.

The National Education Policy (NEP) 2020 (hereafter referred to as NEP or Policy) recognizes that higher education plays an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. It notes that "given the 21st -century requirements, quality higher education must aim to develop good, thoughtful, well-rounded, and creative individuals". In accordance with the NEP 2020, the UGC has formulated a new student-centric "Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)" incorporating a flexible choice-based credit system, multidisciplinary approach, and multiple entry and exit options. This will facilitate students to pursue their career path by choosing the subject/field of their interest. The grading system is considered to be better than the conventional marks system and hence it has been followed in the top institutions in India and abroad. So it is desirable to introduce uniform grading system. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students. To bring in the desired uniformity, in grading system and method for computing the cumulative grade point average (CGPA) based on the performance of students in the examinations, the UGC has formulated these guidelines.

CHOICE BASED CREDIT SYSTEM (CBCS):

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill-based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

OUTLINE OF CHOICE BASED CREDIT SYSTEM

1. **Major Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Major Discipline specific course.
2. **Minor discipline** helps a student to gain a broader understanding beyond the major discipline.
3. **Multidisciplinary Course (MDC):**Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
4. **Interdisciplinary Course (IDC) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).
5. **Ability Enhancement Courses (AEC):** Environmental Science, English Communication/MIL Communicationare mandatory for all disciplines.
6. **Skill Enhancement Courses (SEC):**These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based instruction.
7. **Value Added Courses (SEC):**These courses may be chosen from a pool of courses designed to provide value-based educationicoursesnstruction.

The Proposed new courses in chemistry for undergraduate classes are reassigned in accordance to semester/CBCS/Grading system with new education policy. The new course is based on model curriculum of the university grants commission.

COURSES/ACTIVITIES UNDER THE PROGRAM

1. **Lecture courses**: Courses involving lectures relating to a field or discipline by an expert or qualified personnel in a field of learning, work/vocation, or professional practice.
2. **Tutorial courses:** Courses involving problem-solving and discussions relating to a field or discipline under the guidance of qualified personnel in a field of learning, work/vocation, or professional practice.
3. **Practicum or Laboratory work:** A course requiring students to participate in a project or practical or lab activity that applies previously learned/studied principles/theory related to the chosen field of learning, work/vocation, or professional practice under the supervision of an expert or qualified individual in the field of learning, work/vocation or professional practice
4. **Seminar:** A course requiring students to participate in structured discussion/conversation or debate focused on assigned tasks/readings, current or historical events, or shared experiences guided or led by an expert or qualified personnel in a field of learning,

work/vocation, or professional practice.

5. **Internship:** A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations. Internships involve working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning.
6. **Studio activities:** Studio activities involve the engagement of students in creative or artistic activities. Every student is engaged in performing a creative activity to obtain a specific outcome. Studio-based activities involve visual- or aestheticfocused experiential work.
7. **Field practice/projects:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity.
8. **Community engagement and service:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity. The curricular component of 'community engagement and service' will involve activities that would expose students to the socio-economic issues in society so that the theoretical learning's can be supplemented by actual life experiences to generate solutions to real-life problems.

Objectives of Program

1. Recognizing, identifying, and fostering the unique capabilities of each student to promote her/his holistic development.
2. To meet the growing demand of specialization and advanced courses in applied science.
3. To redesign the courses the special emphasis on local requirements, environment, to link the courses with requirements of the industries and research.
4. Flexibility for learners to move from one institution to another to enable them to have multi and/or interdisciplinary learning.
5. Flexibility to switch to alternative modes of learning (offline, ODL, and Online learning, and hybrid modes of learning)
6. To prepare students for National level entrance test like NET/SLET/JRF and other competitive exams.

General Information and Rules for Semester I to VIII
B.Sc. Honors (Chemistry) with Research or Without Research

1. The medium of instruction will be English or/ & Gujarati, question papers will be set in English and Gujarati but answers in examinations will either in English or Gujarati.
2. Passing standard: As per the revised rules and regulations of Hemchandracharya North Gujarat University, Patan.
3. Viva voce will be part practical examination and it will be pertaining to theory as well as practicals studied during end semester examination.
3. The Certificate will be awarded in major course i.e. chemistry after completion of 01 Year with 44 credits and successful completion of 04 credit vocational course during summer vacation of first year if he/she want to exit the course.
4. The Diploma will be awarded in the in major course i.e. in chemistry after completion of 02 Years with 88 credits and successful completion of 04 credit vocational course during summer vacation of second year if he/she want to exit the course..
5. The B. Sc. degree will be awarded in the in major course i.e. in chemistry after completion of 03 Years with 132 credits.
6. The B. Sc. degree with honors with research or without research will be awarded in the in major course i.e. chemistry after completion of 04 Years with 176 credits with research or without research.
7. The college/ Department will run B. Sc. Honors course with honors or without research or both with prior permission of university.
8. Each student is required to complete all theory papers and practicals as specified in each semester. These will include Major Discipline specific course (MJDSC), Minor Discipline specific course (MIDSC), Multidisciplinary/ Inter disciplinary course (MDC/ IDC), Ability enhancement course (AEC), Value added course (VAC), skill enhancement courses (SEC) and practical's.
9. The choice for paper in Minor Discipline specific course (MIDSC), Multidisciplinary/ Inter disciplinary course (MDC/ IDC), Value added course (VAC), skill enhancement courses (SEC) is left to the student.
10. There will be weightage for continuous comprehensive evaluation (CCE) and & weightage to semester End examination (SEE) in Major Discipline specific course (MJDSC), Minor Discipline specific course (MIDSC), Multidisciplinary/ Inter disciplinary course (MDC/ IDC), Ability enhancement course (AEC), Value added course (VAC), skill enhancement courses (SEC) and practical's.

    The CCE for each semester shall done as per the continuous evaluation process. For 50 marks following activities are to be performed.

    I. Activity for continuous comprehensive evaluation Marks (out of 50)

    (Major Theory)

(a)	Test of theory(Minimum 05)	25
(b)	Assignment/ Quiz	10
(c)	Group Discussion/ Seminar	05
(d)	Problem solving	05
(e)	Attendance	05

II. Activity for continuous comprehensive evaluation (Minor/ Skill/Multi/ Interdisciplinary Theory)	Marks (out of 25)
(a) Test of theory(Minimum 03)	15
(b) Group Discussion/ Seminar	05
(c) Attendance	05
III. Activity for continuous comprehensive evaluation (Major Practical's)	Marks (out of 50)
(a) Internal practical exam Group A	15
(b) Internal practical exam Group B	15
(b) Journal/ Practical Report(Certified)	10
(c) Viva voce	10
IV. Activity for continuous comprehensive evaluation (Minor/ Multi/ Interdisciplinary Practical's)	Marks (out of 25)
(a) Internal practical exam	15
(b) Journal/ Practical Report(Certified)	05
(c) Viva voce	05

11. There shall be coverage of maximum 30% syllabus through online mode of teaching. As per directives of UGC.
12. Students should be encouraged to use electronic media to complete the course.
13. For each semester in Ist year, there will be 550 marks per semester and for completion of certificate course at the time of exit, the total marks will be given out of 1200 (1100+100). The cumulative grade will be given as per university rules.
14. **Note:** During the preparation of this curriculum, ample care is taken for consideration of the followings:
    (a) NEP 2020
    (b) Model curriculum of U.G.C.
    (c) National Credit Frame work Repot of UGC, 2023
    (d) Concept of continuous evaluation
    (e) CGPA (Cumulative Grade Point Average Credit)
    (f) CBCS (Choice Based Credit System)
    (g) Semester approach
    (h) Revised rules and regulation of Hemchandracharya North Gujarat University, Patan.
    (i) KCG Standard Operating Procedure, August 2023
15. For internal remuneration, four hours of Practical's should be considered equivalent to two hours of theory.
16. Minimum 15 students should be in one batch for practical's and external/ internal exam

II	**Major Discipline Specific course MJDSC**	**Fundamentals of Chemistry-II**	**SC23MJDSCCHE201**	**4**	**50**	**50**	**2.30**	**100**
	Minor Discipline Specific course MIDSC	**To be Selected – II Basics of chemistry -II**	**SC23MIDSCCHE202**	**2**	**25**	**25**	**2.00**	**50**
	Multi/Inter disciplinary Course MDC/IDC	**To be Selected (General chemistry -II/ Climate change and Pollution)**	**SC23MDDSCCHE203/ SC23MJDSCCHE203A**	**2**	**25**	**25**	**2.00**	**50**
	Ability Enhancement Courses AEC	**To be Selected (From languages)**	**SC23AECCHE204**	**2**	**25**	**25**	**2.00**	**50**
	Value Added course VAC	**To be Selected (VAC II- Ethics in chemistry)**	**SC23VACCHE205**	**2**	**25**	**25**	**2.00**	**50**
	Skill Enhancement Course SEC	**To be Selected SEC-1Analytical chemistry II or SEC-2 Water analysis or SEC-3 Food analysis or SEC-4 Store management**	**SC23SECCHE206/ SC23SECCHE206A/ SC23SECCCHE206B/ SC23SECCCHE206C**	**2**	**25**	**25**	**2.00**	**50**
	Practical Major Discipline Specific course, MJDSC Practical Minor Discipline Specific course, MIDSC Practical Multi/Inter Disciplinary Course, MDC/IDC	**PMJDC Practical -I Lab Group A & Group B PMIDC Practical-II Lab PMDC/ IDC Practical-1II Lab**	**SC23PMJDSCCHE201 SC23PMIDSCCHE202 SC23PMDCCHE203**	**4 2 2**	**50 25 25**	**50 25 25**	**8 4 4**	**100 50 50**
		Total Credits of Semester - II		**22**	**275**	**275**		**550**

A. Common Formula for Setting Question Papers for Major Discipline Specific course

Time: 2.30 Hours Total Marks: 50

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	13 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	12 Marks
Que. No: 3	Write any Two out of Three Questions	Unit III	13 Marks
Que. No: 4	Write any Two out of Three Questions	Unit IV	12 Marks

B. Common Formula for Setting Question Papers for Minor/ Multi/Inter disciplinary Courses

Time: 2.00 Hours Total Marks: 25

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	08 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	08 Marks
Que. No: 3	Write any three Small relevant Questions	Unit I, II	09 Marks

C. Common Formula for Setting Question Papers for Value added/ Skill Enhancement Courses

Time: 2.00 Hours Total Marks: 25

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	08 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	08 Marks
Que. No: 3	Write any three Small relevant Questions	Unit I, II	09 Marks

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MJDSCCHE201

Type of course : Major Discipline Specific course MJDSC
Name of course : Fundamentals of chemistry II
Total Marks : 100

Effective from June 2023 Under NEP 2020

Total Credits : 04	Teaching Hours per Week: 04 Teaching Hours per Semester: 60	Theory	External 50 Marks Internal 50 Marks

Course Objectives:

1. To understand concepts of inorganic chemistry in terms of coordination compounds, p lock elements.
2. To apply Stereo chemistry and spatial arrangement of some compounds.
3. To understand Thermodynamics as basis of general laws of sustainable equilibrium.
4. To know about the Volumetric titrations and calculations for estimation various ions.

Course Outcomes:

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Majors to be certified by the American Chemical Society will have extensive laboratory work and knowledge of Biological Chemistry.
2. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
3. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
4. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
5. Students will be able to function as a member of an interdisciplinary problem solving team.

Unit	Topic	Credit	Hr
1	**Coordination Compounds** Werner,s Theory; Explain the structure of Co(III) ammines on the basics of Werner's theory, Experimental evidence in favor of Werner's theory Sidgwick's effective atomic number (EAN) rules, Application of EAN rules, Nomenclature of Coordination compounds. Nature of Metal legend bonding VB theory, Limitation of VB theory. Isomerism in Coordination Compounds, Structural, Conformation, Ionization, Hydrate, Coordination, Linkage, Coordination position, Ligand and Polymerization isomerism. Stereo isomerism, Geometrical isomerism and Optical isomerism.	1	15
2.	**Stereochemistry** Introduction of Stereo Isomers; **(A) Optical isomerism :** General, Discussion of elements of symmetry, Molecular chirality, Enantiomers, Optical activity, Properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, Diastereomers, R-S Nomenclature, Threo and Erythro diastereomers, Meso compounds. **(B) Geometrical isomerism:** Definition and general discussion of geometric isomers, General Methods of structure determination (physical methods), E-Z nomenclature, (Simple illustration should be given). **(C) Conformational isomerism:** Definition, Conformational analysis of ethane, n-butane with rotationalAnd tortional diagram, Conformation of cyclohexane, Axial and Equitorial bonds, Newmann projection, Show horse formula, Fisher &flying wedge formula, Difference between conformation and configuration.	1	15
3.	**Thermodynamics** Thermodynamics (only introduction) : System and surrounding- work & heat, state function, thermodynamic process, internal energy,	1	15

	enthalpy, free energy, maximum work function. First law of thermodynamics heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship, Work done in adiabatic and isothermal reversible expansion of an ideal gas. Second law of thermodynamics, Carnot cycle and its efficiency , Concept of entropy; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases. Gibbs- Helmholtz equation, Vant hoff isochore equation, Vant hoff isotherm equation, Numerical.		
4.	**(A) Introduction To Volumetric Analysis** Principle, Mechanism and Applications of Acid-Base Titrations (Only strong acid Vs strong Base), Redox Titrations (Only Fe(II) Vs $KMnO_4$), Complexo metric Titrations (Only $Ca^{+2/}Mg^{+2}$Vs EDTA), Precipitation Titrations (Only Vs $AgNO_3$), Related Numerical. **(B) Complexometric titrations** Introduction, EDTA :An important chelating Agents Types of EDTA titration metallochromic indicators, Factors Affecting on stability of complexes, masking and de masking, selectivity of titration construction of the titration curve.	1	15

Books Recommended:

Inorganic Chemistry

1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.

3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.

4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

Physical Chemistry

1. Advance Physical Chemistry by Gurdeep raj.

2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.

3. Principal of Physical Chemistry by Puri Sharma, Pathania.

Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos& West.

2. Analytical Chemistry, Garry D.Christain.

3. Analytical Chemistry, Day & Underwood.

4. Analytical Chemistry by Lerry&Hergins.

5. Qualitative Analysis by A.I.Vogel, 5thedn.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.

2. Text book of Organic Chemistry, ArunBahal, S.Chand.

3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.

4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.

5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.

6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.

7. Physical Chemistry by P.W.Atkins. 5^{th} edn.Oxferd 1994 7thedn-2002.

8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.

9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.

10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**

PROGRAM CODE : SCIUG102

COURSE CODE : SC23PMJDSCCHE201

Type of course : Practicals Major Discipline Specific Course PMJDSC

Name of Course : Practical's for Fundamentals of chemistry II

Total Marks : 100

Effective from June 2023 Under NEP 2020

GROUP A

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 12	Practicals	External 25 Marks Internal 25 Marks

GROUP B

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 08	Practicals	External 2 5Marks Internal 25 Marks

Course Objectives:

1. To identify the cationic and .anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals **(Any twelve)**	Credit	Hr
GROUP A	**Inorganic Chemistry Semi micro Analysis:** Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 12 compounds.	2	60
GROUP B	**Volumetric Titrations (Any Eight)** 1. To determine the strength of NaOH and Na_2CO_3 present in	2	60

	the mixture of NaOH & Na_2CO_3 solution and to find out their percentage composition. 2. To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the solution mixture of $NaHCO_3$ & Na_2CO_3 solution and to find out their percentage composition. 3. To determine the Normality, gram/liter and molarities of $H_2C_2O_4.2H_2O$ and H_2SO_4 present in the mixture of $H_2C_2O_4.2H_2O$ and H_2SO_4 solution by using X N NaOH and Y N $KMnO_4$ solutions. 4. To determine the Normality, gram/liter and molarity of $H_2C_2O_4$.$2H_2O$ and $K_2C_2O_4$ present in the mixture of $H_2C_2O_4$. $2H_2O$ & $K_2C_2O_4$ solution by using X N NaOH and Y N $KMnO_4$ solutions. 5. To determine the amount of Ca^{2+} and Mg^{2+} ion by EDTA solution from the mixture of $CaCl_2$ and $MgCl_2$ solution. 6. Determination of chloride ions in the given solution by titrating against the standardized solution of silver nitrate. 7. To determine the concentration/molarity of $KMnO_4$ solution by titrating it against Standard solution of ferrous ammonium sulphate. 8. Preparation of standard stock solution of NaOH by W/V method and their different dilutions. 9. Preparation of standard stock solution of $K_2Cr_2O_7$ by W/V method and their different dilutions. 10. To determine molar mass of unknown acid by titration with NaOH.		

Books Recommended:

1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.
2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MIDSCCHE202

Type of course : Minor (Elective) Discipline Specific course MIDSC

Name of course : Fundamentals of chemistry II

Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per Semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. To understand concepts of inorganic chemistry in terms of coordination compounds, p lock elements
2. To apply Stereo chemistry and spatial arrangement of some compounds.

Course Outcomes:

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Inorganic and Physical Chemistries.
2. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
3. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
4. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.

Unit	Topic	Credit	Hr
1	**Coordination Compounds** Werner,s Theory; Explain the structure of Co(III) ammines on the basics of Werner's theory, Experimental evidence in favor of Werner's theory Sidgwick's effective atomic number (EAN) rules, Application of EAN rules, Nomenclature of Coordination compounds. Nature of Metal legend bonding VB theory, Limitation of VB theory. Isomerism in Coordination Compounds, Structural, Conformation, Ionization, Hydrate, Coordination, Linkage, Coordination position, Ligand and Polymerization isomerism. Stereo isomerism, Geometrical isomerism and Optical isomerism.	1	15
2	**Stereochemistry** Introduction of Stereo Isomers; **(A) Optical isomerism :** General, Discussion of elements of symmetry, Molecular chirality, Enantiomers, Optical activity, Properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, Diastereomers, R-S Nomenclature, Threo and Erythro diastereomers, Meso compounds. **(B) Geometrical isomerism:** Definition and general discussion of geometric isomers, General Methods of structure determination (physical methods), E-Z nomenclature, (Simple illustration should be given). **(C) Conformational isomerism:** Definition, Conformational analysis of ethane, n-butane with rotationalAnd tortional diagram, Conformation of cyclohexane, Axial and Equitorial bonds, Newmann projection, Show horse formula, Fisher &flying wedge formula, Difference between conformation and configuration.	1	15

Books Recommended:

Inorganic Chemistry

1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.

3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.

4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

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2. Text book of Organic Chemistry, ArunBahal, S.Chand.

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5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.

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8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.

9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.

10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMIDSCCHE202

Type of course : Practicals Minor (Elective) Discipline Specific Course PMIDSC
Name of Course : Practical's for Fundamentals of chemistry II
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To identify the cationic and .anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals	Credit	Hr
1	**Inorganic Chemistry Semi micro Analysis: (Any six)** Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 08 compounds.	1	30
2	**Volumetric Titrations (Any four)** 1) To determine the strength of NaOH and Na_2CO_3 present in the solution mixture of NaOH & $Na_2CO_3$and to find out their percentage composition. 2) To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the solution mixture of $NaHCO_3$ & Na_2CO_3 and to find out their	1	30

	percentage composition. 3) To determine the Normality, gram/liter and molarities of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 present in the solution mixture of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 by using X N NaOH and Y N $KMnO_4$ solutions. 4) To determine the Normality, gram/liter and molarity of $H_2C_2O_4$ $2H_2O$ and $K_2C_2O_4$ present in the solution mixture of $H_2C_2O_4$ $2H_2O$ & $K_2C_2O_4$ by using X N NaOH and Y N $KMnO_4$ solutions. 5) To determine the amount of Ca^{+2} and Mg^{+2} ion by EDTA solution from the mixture solution of $CaCl_2$ and $MgCl_2$. 6) Calibration of burette Pipette and measuring flasks.		

Books Recommended:

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2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE203

Type of course : Multidisciplinary course MDC

Name of course : General chemistry II

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per Semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. To understand Thermodynamics as basis of general laws of sustainable equilibrium.
2. To know about the Volumetric titrations and calculations for estimation of various ions.

Course Outcomes:

1. Students will be able to explore new areas of research in both medicinal chemistry and allied fields of science and technology.
2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
4. Students will be able to function as a member of an interdisciplinary problem solving team.

Unit	Topic	Credit	Hr
1	**Thermodynamics** Thermodynamics (only introduction) : System and surrounding- work & heat, state function, thermodynamic process, internal energy, enthalpy, free energy, maximum work function.	1	15

	First law of thermodynamics heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship, Work done in adiabatic and isothermal reversible expansion of an ideal gas. Second law of thermodynamics, Carnot cycle and its efficiency , Concept of entropy; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases. Gibbs- Helmholtz equation, Vant hoff isochore equation, Vant hoff isotherm equation, Numerical.		
2	**(A) Introduction To Volumetric Analysis** Principle, Mechanism and Applications of Acid-Base Titrations (Only strong acid Vs strong Base), Redox Titrations (Only Fe(II) Vs $KMnO_4$), Complexo metric Titrations (Only $Ca^{+2/}Mg^{+2}$Vs EDTA), Precipitation Titrations (Only Vs $AgNO_3$), Related Numerical. **(B) Complexometric titrations** Introduction, EDTA :An important chelating Agents Types of EDTA titration metallochromic indicators, Factors Affecting on stability of complexes, masking and de masking, selectivity of titration construction of the titration curve.	1	15

Books Recommended:

Physical Chemistry

1. Advance Physical Chemistry by Gurdeep raj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.

Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5thedn.

Further Reading:

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7. Physical Chemistry by P.W.Atkins. 5th edn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE203

Type of course : Practicals Multi Disciplinary Course PMDC
Name of course : Practical's General chemistry II
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To identify the cationic and .anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions in inorganic mixtures.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals	Credit	Hr
1	**Inorganic Chemistry Semi micro Analysis: (Any six)** Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 08 compounds.	1	30
2	**Volumetric Titrations (Any four)** 1) To determine the strength of NaOH and Na_2CO_3 present in the solution mixture of NaOH & $Na_2CO_3$and to find out their percentage composition. 2) To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the	1	30

	solution mixture of $NaHCO_3$ & Na_2CO_3 and to find out their percentage composition. 3) To determine the Normality, gram/liter and molarities of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 present in the solution mixture of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 by using X N NaOH and Y N $KMnO_4$ solutions. 4) To determine the Normality, gram/liter and molarity of $H_2C_2O_4$ $2H_2O$ and $K_2C_2O_4$ present in the solution mixture of $H_2C_2O_4$ $2H_2O$ & $K_2C_2O_4$ by using X N NaOH and Y N $KMnO_4$ solutions. 5) To determine the amount of Ca^{+2} and Mg^{+2} ion by EDTA solution from the mixture solution of $CaCl_2$ and $MgCl_2$. 6) Calibration of burette Pipette and measuring flasks.		

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by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE203A

Type of course : Multi Disciplinary Course MDC
Name of course : Pollution and Climate change
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. The course on Climate Change has been framed with an intention to provide a general concept within the dimensions of climate changes.
2. It is to equip the learners with appropriate tools and techniques for interpreting the impacts of climate change, and evaluating & implementing measures that reduce vulnerability of systems.
3. It offers an opportunity to interact with administrators, community leaders, NGOs and professionals helping the students to understand the broad framework of Climate Change in India in general and Gujarat in particular.

Course Outcomes:

1.To know the impacts that climate change is having on the natural environment; understand how climate change has the potential to exacerbate air pollution , soil erosion with potentially life threatening consequences
2. To understand how climate change can lead to habitat destruction and how habitat destruction can interact with other aspects of climate change to threaten the survival of some animal species.
3. Recognize how systems work by seeing the relationships between climate and other forms of environmental change.

Unit	Topic	Credit	Hr
1	**Pollution:** Environment pollution: Causes, effects and control measures of, Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear hazards Climate change, Causes of climate change, Climate Change and Water , Forest and Biodiversity , Coastal Ecosystem , Agriculture and Food Security. Issues due to climate change: Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and Holocaust, Vertical temperature.	1	15
2	**Status due to climate change:** Sustainable Development Goals: An Climate Change and Sustainable Development, World, National and State Policies for Achieving Sustainable Development Goals, Role of Various Stakeholders , Building Partnership for Climate Change and Sustainable Development. Calculation of global mean temperature, Climate change threats in India, CCPI climate change Performance Index, Some Case Studies.	1	15

Books Recommended:

1. Textbook for Environmental Studies Bharati Vidyapeeth Institute of Environment Education and Research Pune. Online available: https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf
2. Environmental Chemistry by H Kaur, Pragati prakashan, 2020

Further Reading:

1. The Climate Solution: India's Climate-Change Crisis and What We Can Do About It by Mridula Ramesh, Hachette book publications, Gurugram , New Delhi 2018
2. The New Climate War, The Fight to Take Back Our Planet By Michael E. Mann , scribe publishers. Co. Uk, 2021.
3. The Nutmeg's Curse: Parables for a Planet in Crisis by Amitav Ghosh, University of Chicago Press, 2021.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE203A

Type of course : Practicals Multi Disciplinary Course PMDC
Name of course : Practicals For Climate change and Pollution
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To learn about climate change mapping.
2. To Prepare the data for carbon dating.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of various parameters for climate change.
2. Students will have basic knowledge about instruments needed for climate change.
3. To relate pollution parameters toclimate change.

Sr.No.	List of Practicals	Credit	Hr
1	**(Any five)** 1. Conventional Measurements Of Pressure, Temperature, Humidity, Wind, Precipitation, Visibility, Clouds, Soil Temperature, Moisture. 2. Fieldwork and checking climatic conditions In Nearest Climate in Farm or Forest or Desert or Water body, Analysis and interpretation of surface meteorological data. 3. Introduction to MATLAB in climate change. 4. To demonstrate the concept of thermal expansion of water when heated, as an analogy to thermal expansion of oceans due	1	30

	to global warming. 5. Showing windy, animated weather map using GIS interface using current and projected wind and other weather conditions for any location in country. 6. Global temperature projections with increasing and decreasing greenhouse gas emissions. 7. The animation showing changes in temperature across the cities, countries, relative to pre industrial level under two different emissions in climate change model. The first emission increasing continuously in a period and second showing decrease in emission in different period or state or country.		
2	**(Any Five)** 8. Two experiments showing role of plants in mitigationg the acidification caused by dissolution of CO2 in water: Uptake of Carbon dioxide from water by plants 9. Useof Carbon Footprint Calculator to study Climate Change for three sectors home energy use, local transportation and home waste generation. 10. To study Comparison of the Effects of Increased CO2 in the Air to Seawater and Distilled Water **11.** To study detailed information on low-carbon lifestyles**.** 12. To develop data for your area on save energy.To arrange and assess data on Walk, bike, or take public transport. And shift to electric vehicles to save climate. 13. Demonstrate save food and environ protection by throwing less food or no food. 14. Prepare report on Environmental Policy Debate at National level or at international agreements, or Montreal protocol 1987 Kyoto protocol 1997, or Convention on Climate Change, or Carbon credit and carbon	1	30

	trading, or Clean development mechanism.		

Books Recommended:

1. Practical Agricultural Meteorology: Srivastava A.K. and P. K. Thyagi; New India Publishing Agency, New Delhi

2. The Practice of Weather Forecasting: Wickham P.G; HMSO, London 3. Weather and Climate: Woodcock R. G., Macdonald and Evans

Further Reading:

1. A guide to matlab: Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg. Kevin R. Coombes, John E. Osbom, Garrett J. Stuck.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23VACCHE205

Type of course : Value Added course VAC
Name of course : Ethical and Social Dimensions of Chemistry
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. Understanding basic Philosophy of chemistry and applying it in daily research activity.
2. Increasing knowledge on theory, conduct and communication of science.
3. Applying Ethics to chemistry Practice.
4. Developing a sense of right and wrong leading to practical ethical behavior.

Course Outcomes:

1. Development of a positive character, empathetic human being, responsible citizen, a compassionate and empathetic being.
2. Learning concepts of responsibility and sustainability in S&T.
3. Promoting a sustainable life style for the individual, community and environment protection.
4. Inculcating a positive work culture respecting professional ethics.

Unit	Topic	Credit	Hr
1	**Introduction:** Science conduct, logic and theory of science, experimentation, writing publications, dealing with uncertainty, social impact of scientific activity. Applying the fundamentals in philosophy of science and research ethics to the particular conduct of science and its internal and	1	15

	external domains of responsibility is expected to sharpen and solidify the students' awareness for the theory of research practice, their knowledge of Ethics and their ability to exploit ethical thinking for the application in the social sphere , science and technology as a field of human activity that impacts the quality of life of people all over the planet.		
2	**Applied Ethics:** Applied Ethics in Science and Technology, domains of Bioethics, Medical Ethics, Environmental Ethics, Profession Ethics and Business Ethics. Some examples from chemistry, science in general, research, engineering, R&D, etc. in the history of societies worldwide, the students should get a sense for the Ethos of science conduct, on the one hand, challenges in society and environment with a higher degree of sustainability. Qualities of good citizen, volunteerism, building chemistry through volunteerism, Patriotic values and ingredients of nation building,	1	15

Books Recommended:

1. Indian Culture Values and Professional Ethics (For Professional Students) by P. S. R. Murty, Edition, 2nd Edition, publisher
2. A Foundation Course in Human Values and Professional Ethics by R.R. Gaur (Author), R. Sangal (Author), G.P. Bagaria , publisher KirtiPrakashan,30 April 2010.
3. The Power of Ethics: How to Make Good Choices When Our Culture Is on the Edge by Simon and Schuster · Narrated by Susan Liautaud, publisher :The Little Book of Big Ethical Questions,Susan Liautaud, Jan 2021.
4. Ethics in chemistry from poison gas to climate engineering by Joachim Schummer and TomBorsen (Aalborg University, Denmark), https://doi.org/10.1142/12189 | March 2021.

Further Reading:

1. International ethics in chemistry: Developing common values across cultures by Susan M. Schelbe and Kelly M. Elkins, Publication American chemical Society, United states, Nov 21, 2021.

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Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206

Type of course : Skill Enhancement Course SEC
Name of course : Analytical Chemistry-II
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 02 Teaching hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. To estimate the physical properties and available nutrient status (macro, secondary and micro-nutrients) of soils.
2. Evaluation of fertility status of soil
3. To provide soil test based recommendations to farmers for improving soil fertility and economic return to farmers.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in assessing laboratory reagents.
2. To understand the importance glass wares in chemical laboratories and in performing experiments.
3. Students will learn how to prepare chemical solutions needed in chemical laboratories.

Unit	Topic	Credit	Hr
1	**BASICS OF NANOMATERIALS** Basics of Nanomaterials: Definition, size-shape dependent properties, top-down and bottom-up approaches for nanomaterials, synthesis, general applications of nanomaterials, names of techniques for analysis of nanomaterials.	1	15

2	**POLYMERS:** Introduction, natural and synthetic polymers, Degradation in polymer, issues related degradation, biodegradable and non-degradable polymers. The RCI codes for plastic: Use in recycling. Applications of polymers, single use plastic. Status of polymer degradation at national and international level.	1	15

Books Recommended:

1. Poole, Jr.; Charles, P.; Owens, Frank, J. (2003), Introduction to Nanotechnology, a. John Wiley and Sons.

2. Chattopadhyay, K. K.; Banerjee, A. N. (2009), Introduction to Nanoscience and a. Technology, PHI. 3. Carraher, C. E. Jr. (2013), Seymour's Polymer Chemistry, Marcel Dekker, Inc.

4. Ghosh, P. (2001), Polymer Science and Technology, Tata Mcgraw-Hill.

5. Gwarikar, Polymer Science (2009), New India publisher.

6. Billmeyer, Text book of Plymer science, Tata Mcgraw-Hill. 1998.

Further Reading:

1.https://www.youtube.com/watch?v=0k4ryWpwhmo

2. https://en.wikipedia.org/wiki/Cement

3. https://nptel.ac.in/courses/118104008

4. https://ccsuniversity.ac.in/bridge-library/pdf/L3%20Synthesis%20of%20Nanostructured%20Materials%20Prof%20BPS.pdf

5. https://www.tutorialsduniya.com/notes/chemistry-of-cosmetics-perfumes-notes

6. https://pharmacy.hebmu.edu.cn/trywhx/resources/43/2019624163611.pdf

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Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206A

Type of course : Skill Enhancement Course SEC
Name of course : Food Analysis and Quality Control
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. To develop the skills on the standardization of food products with respect to quality maintain according to universal food standards worldwide.
2. To learn principles of analysis.
3. To know about chemical properties of food components in food industries..
4. To manage the long term quality of foods in storage.

Course Outcomes:

1.Students will have a thorough understanding on the quality attributes, their measurement principle andϖ instrumentation of various instruments used in food quality analysis.

2. The students will know the importance of various methods to identify any adulteration aspect of food.

3. Students will have a thorough understanding on various food laws with their amendments and regulationϖ guidelines followed in national and international.

Unit	Topic	Credit	Hr
1	**Concept of quality:** Quality attributes: physical, chemical, nutritional and microbial evaluation and measurement, physiochemical method, microscopic examination and physical method; Sensory evaluation: Sensory characteristics of food, sensory requirements, Types of sensory evaluation. Objective evaluation: Tests used for objective evaluation,	1	15

	application and limit, Instruments used for quality assessment-color & gloss, size & shape, defects, texture, Viscosity & consistency, **Food adulteration and food toxins:** Common adulterant in food (milk and milk products, edible oils, cereals&pulses, prepared foods, spices, beverages); simple screening, control of food adulteration. Food Toxins: Natural antinutritional factors, microbial toxins.		
2	**Measurement of toxicants and toxicity:** Assessment of toxicity of evaluation of limits of contaminants in contexts of food safety. Food associated carcinogenesis, Food chemical carcinogens-sources and mechanism, food allergens, Industrial food processing and Packaging contaminants. **Food laws and regulation:** Mandatory and voluntary food laws, International quality systems and standards like ISO and Food Codex, BRC; International trades & federal agencies, Indian act-Food Safety and Standards Act, 2006, Various food acts- PFA,FPO,AGMARK, MMPO,MFPO, edible oil acts, standard weight acts.	1	15

Books Recommended:

1. Subash. C Jain, International Marketing, 6th edition.

2. Varshney, R.L and Bhattacharya, B International markaetying management and Indian perspective, Sultan chand and sons, New Delhi.

3. Kohler P, Keller K.L, Koshy A, Jha M, 13th edition 2009, Marketing Management- A South Africa Perspective, Pearson Education, New Delhi.

Further Reading:

4. Ramaswamy, V.S and Namakumari ,S.; 4th edition Marketing Manangement –Global Perspective- Indian Content, McMillan Publishers India Ltd, New Delhi.

5. Saxena, Rajan, 3rd edition; Marketing management, Tata McGraw Hill Publishing Company Ltd, New Delhi.

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Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206B

Type of course : Skill Enhancement Course SEC
Name of course : Chemical Storage Management
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. To understand and appreciate the importance of store keeper in storage of chemicals.
2. Safety in storage of chemicals.
3. To manage the long term quality of chemicals in storage.

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in assessing the role of store keeper in chemical sciences.

2. Explores the problems that can arise during storage of chemicals in a storage.

3. Chemical Store management is a valuable tool for smooth functioning of chemical laboratories.

4. A proper store management will help in safety of chemical sciences department and success to reach applications

Unit	Topic	Credit	Hr
1	**Storing Chemicals:** General rules for storing chemicals, General requirements, Segregation of incompatible chemicals, Specifications for chemical storerooms, Chemical storage in laboratories (outside of chemical storerooms) , Additional storage requirements and recommendations for specific hazard chemical classes. Organization and types of chemicals to be	1	15

	stored. **Store Keeper:** Qualities of store keeper, duties of store keeper, Responsibilities of storekeeper, functions of storekeeper, skills of storekeeper, management ofinventory,Trade exemption, Tendering for new purchase.		
2	**Classification of laboratory Chemicals:**, Classification of Chemicals on the basis of hazard level**,** (Explosive, Oxidizing, Flammable, toxic, Harmful), Chemical segregation, storage limitations, storage cabinets and safety cabinets, Guidance on Safe Storage of Chemicals in Laboratories: Principles of Safe Storage, Storage Facilities, Acid cabinets, Flammable solvent cabinets, Ventilated cabinets T, Storage of Different Materials, Carcinogens and Mutagens (class 1 and 2) and Substances Toxic to Reproduction - Substances subject to special security & licensing requirements, Novel /experimental substances.	1	15

Books Recommended:

1. The Merck Index : An Encyclopedia of Chemicals, Drugs, and Biologicals, Hardcover, 14th edition, Printed Nov. 2006.
2. Safe Storage of Laboratory Chemicals, Hardcover2nd edition, Printed May 1991 by Wiley-Interscience.

Further Reading:

1. Safe Laboratories : Principles and Practices for Design and Remodeling, Hardcover (January 1991), prepared with the assistance of American Chemical Society Committees.

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Program Name **: B. Sc. Chemistry** **Semester : II**

PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206C

Type of course : Skill Enhancement Course SEC
Name of course : Water Quality Assessment
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02	Teaching Hours per Week: 02 Teaching Hours per semester: 30	Theory	External 25 Marks Internal 25 Marks

Course Objectives:

1. to obtain quantitative information on the physical, chemical, and biological characteristics of water via statistical sampling
2. The type of information sought depends on the objectives of the monitoring program.

Course Outcomes:

1. Explain the general properties of water and understand water resources and water conservation.
2. Develop awareness about water quality criteria and standards, and their relation to public health and environment
3. Understand important parameters for measuring water quality.
4. Know about the methods for the determination of water quality parameters
5. Learn how to run accurate water quality tests and to determine how the parameters relate to each other.

Unit	Topic	Credit	Hr
1	**Water Quality Fundamentals:** Chemistry of water, Physical and chemical properties, Water recourses, water pollution, Important water Quality parameters and methods for their determination - turbidity, color, taste, pH, acidity, alkalinity,	1	15

	chemical constituents, hardness, dissolved oxygen etc., water sampling, standard for drinking water as per BIS specifications, household water treatment and safe storage. **Water quality standards** in India, Industrial water quality standard in India, Water management. Water control Agency and Laws to monitor and enforce water quality standards in India, Water Pollution Act.		
2	**Laboratory tests for water quality monitoring:** Determination of pH and conductivity, Test for acidity and alkalinity, Test for total hardness, Test for chloride, calcium, iron etc., calculation of magnesium content and total solids. III. Project Quality assessment of water samples collected from different localities.	1	15

Books Recommended:

1. Subash. C Jain, International Marketing, 6th edition.

2. Varshney, R.L and Bhattacharya, B International markaetying management and Indian perspective, Sultan chand and sons, New Delhi.

3. Kohler P, Keller K.L, Koshy A, Jha M, 13th edition 2009, Marketing Management- A South Africa Perspective, Pearson Education, New Delhi.

Further Reading:

4. Ramaswamy, V.S and Namakumari ,S.; 4th edition Marketing Manangement –Global Perspective- Indian Content, McMillan Publishers India Ltd, New Delhi.

5. Saxena, Rajan, 3rd edition; Marketing management, Tata McGraw Hill Publishing Company Ltd, New Delhi.

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NAAC "A" (3.02) State University

PATAN - 384 265

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ONE EARTH • ONE FAMILY • ONE FUTURE

पावका नः सरस्वती

FACULTY OF SCIENCE

B.Sc. (Honours) BOTANY

(With Research/without Research)

SCIUG103

Semesters: I and II

(with multiple entry & exit option)

SYLLABUS

Curriculum as per UGC Guideline

Framed according to National Education Policy (NEP) - 2020

With effect from June – 2023 (and thereafter)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265

B.Sc. (Honours) Botany Programme

(With Research/without Research)

SCIUG103

NEP-2020

With effect from June – 2023 (and thereafter)

FACULTY OF SCIENCE

Subject: BOTANY

B. Sc. Semesters: I and II

Total Pages: 01 to 69

Submitted on

Date: /06/2023

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC "A" (3.02) State University

PATAN - 384 265

BOARD OF STUDIES (BOS) IN BOTANY

References: No. AK/AxS/2125/2020 Dt. 28/08/2020.
No. AK/AxS/2315/2020 Dt. 04/09/2020.
No. AK/AxS/3006/2020 Dt. 01/10/2020.

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B.Sc. Semester II Courses :: BOTANY::

Theory Courses	Programme Code	Title (Course Code)	Practical Courses
Major (MJDSC) (credits: 4+4)	SCIUG103	BIOMOLECULES AND CELL BIOLOGY (SC23MJDSCBOT201) (credits:4)	BIOMOLECULES AND CELL BIOLOGY (SC23PMJDSCBOT201) (GROUP A+ GROUP B) (credits:2+2)
Minor (MiDSC) (credits: 2+2)	SCIUG103	ORGANIC MOLECULES AND CYTOLOGY (SC23MiDSCBOT202) (credits:2)	ORGANIC MOLECULES AND CYTOLOGY (SC23PMiDSCBOT202) (credits:2)
Multi/Inter Disciplinary(MDC) (credits: 2+2)	SCIUG103	FRUITS AND VEGETABLE PROCESSING (SC23MDCBOT203) (credits:2)	FRUITS AND VEGETABLE PROCESSING (SC23PMDCBOT203) (credits:2)
Ability Enhancement (AEC) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23MDCBOT204) (credits:2)	—
Indian Knowledge System (IKS) (credits: 2)	SCIUG103	FROM POOL OF COURSE (SC23IKSBOT205) (credits:2)	—
Skill Enhancement (SEC) (credits: 2)	SCIUG103	NATURAL RESOURCE MANAGEMENT (SC23SECBOT206) (credits: 2)	—

CONTENTS

SUMMARY OF THE PROGRAMME

SYLLABUS DURATION	**SEMESTER PATTERN *I.E.*, SIX MONTHS (single major)**
THEORY	
No. of Discipline Specific Major Core Courses (MJDSC)	***01/Semester***
Credits per Discipline Specific Major Core Course (MJDSC)	*04*
Total credits for Discipline Core Major Course (MJDSC)	***04/Semester***
Theory lectures per Discipline Major Core Course (MJDSC)	*04/week*
No. of Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) & Value Added Course (VAC)/Indian Knowledge System (IKS)	***01/Semester***
Credits per Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) & Value Added Course (VAC)/ Indian Knowledge System (IKS)	*02*
Total credits for Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC) Skill Enhancement Courses (SEC) & Value Added Course (VAC)/ Indian Knowledge System (IKS)	***02/Semester***
Theory lectures per Minor(MiDSC), Multi / Inter Disciplinary Courses (MDC / IDC), Ability Enhancement Courses(AEC) Skill Enhancement Courses (SEC) & Value Added Course (VAC)/ Indian Knowledge System (IKS)	*02 /week*
PRACTICAL	
No. of Practical courses *per Discipline Specific Major Core Courses (MJDSC)*	***01 (in each semester)***
Credits per Practical course	***04(GROUP A:2+GROUP B:2)***
Total Credits of Practical course	*02+02/Semester*
Total Practical lectures	*08(04 +04/week/ batch)*
No. of Practical course (in Uni. Exam.)	***01****/Semester* ***(GROUP A+GROUP B)***
No. of Practical courses *per Discipline Specific Minor (MiDSC) & Multi /Inter Disciplinary Courses (MDC / IDC)*	***01 (in each semester)***
Credits per Practical course	***02***
Total Credits of Practical course	*02/Semester*
Total Practical lectures	*04/week/ batch*
No. of Practical course (in Uni. Exam.)	***01****/Semester*
EVALUATION	
Examination (including Preparation - week)	***5***
No. of Days per week	***6***
Week (days) available for Teaching	***15*** *(90)*
Duration of each lecture (minutes)	***55***
No. of students/batch	***20*** *(on approval of AC and Exam. Unit)*

Framed according to National Education Policy (NEP) - 2020

Under Choice Based Credit System-Semester-Grading System pattern

UG (B. Sc.) Programme in Botany

Semester-I and II

PREAMBLE:

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. The upgradation of undergraduate programmes in the line of NEP, 2020 will play an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. A holistic and multidisciplinary education would aim to develop all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such an education will help develop well-rounded individuals that possess. Such changes will further result in learning outcome based curriculum in order to maximize the benefits of the newly designed curriculum. The learning outcome based curriculum in general and in Botany in particular will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this.

The template as developed has the provision of ensuring the integrated personality of the students in terms of providing opportunity for exposure to the students towards core courses, discipline specific courses, generic elective courses, ability enhancement courses and skill enhancement courses with special focus on technical, communication and subject specific skills through practical and other innovative transactional modes to develop their employability skills. The template of learning outcome based framework has categorically mentioned very well defined expected outcomes for the programme like core competency, communication skills, critical thinking, affective skills, problem-solving, analytical, reasoning, research-skills, teamwork, digital literacy, moral and

ethical awareness, leadership readiness and so on along with very specific learning course outcomes at the starting of each course. Therefore, this template on Learning Outcomes based Curriculum Framework (LOCF) for B.Sc. with Botany/ Botany Honours under the University will be in the line of NEP, 2020 – more flexible, multi-disciplinary, holistic and will definitely be a landmark in the field of outcome based curriculum construction.

Today plant science is a fusion of the traditional components with the modern aspects of biochemistry, molecular biology and biotechnology. Over the years, plant science (Botany) has shown enormous gain in information and applications owing to tremendous inputs from research in all its aspects. With global recognition of the need for conservation, field plant biologists have contributed significantly in assessing plant diversity. Taxonomists have explored newer dimensions for the classification of plants. New insights have been gained in functional and structural aspects of plant development by utilizing novel tools and techniques for botanical research. Challenging areas of teaching and research have emerged in ecology and reproductive biology. Concern for ever increasing pollution and climate change is at its highest than ever before. Keeping these advancements in view, a revision of the curriculum at the undergraduate level is perfectly timed. From the beginning of the session, the Botany students across Indian Universities shall have the benefit of a balanced, carefully-crafted course structure taking care of different aspects of plant science, namely plant diversity, physiology, biochemistry, molecular biology, reproduction, anatomy, taxonomy, ecology, economic botany and the impact of environment on the growth and development of plants. All these aspects have been given due weightage over the six semesters. It is essential for the undergraduate students to acquaint themselves with various tools and techniques for exploring the world of plants up to the sub- cellular level. A paper on this aspect is proposed to provide such an opportunity to the students before they engage themselves with the learning of modern tools and techniques in plant science. Keeping the employment entrepreneurship in mind, applied courses have also been introduced. These courses shall provide the botany students hands on experience and professional inputs. On the whole, the curriculum is a source of lot of information and is supported by rich resource materials. It is hoped that a student graduating in Botany with the new curriculum will be a complete botanist at Honours level.

NEP-2020:

NEP, 2020 aims at a new and forward-looking Vision for India's Higher Education System. This curriculum framework for the bachelor-level program in Botany is developed keeping in view of the student centric learning pedagogy, which is entirely multidisciplinary outcome-oriented and curiosity-driven. To avoid rote -learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum framework focuses on pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works. The platform aims at equipping the graduates with necessary skills for botany-related careers, careers with general graduate-level aptitude and for higher education in Botany and allied subjects. Augmented in this framework are graduate attributes including critical thinking, basic psychology, scientific reasoning, moral ethical reasoning and so on, qualification descriptors that are specific outcomes pertinent to the discipline of botany, learning outcomes for the two programmes these frameworks have been developed, learning outcomes for individual courses, pedagogical methods and assessment methods. Looking at all these new concepts and progress, the detailed syllabus of B.Sc. (H) – Botany has been designed and decided to be implemented from the academic session from June 2023-24.

APPROACH TO CURRICULUM PLANNING:

While designing these frameworks, emphasis is given on the objectively measurable teaching-learning outcomes to ensure employability of the graduates. In line with recent trends in education section, these frameworks foster implementation of modern pedagogical tools and concepts such as flip-class, hybrid learning, MOOCs and other e-learning platforms. In addition, the framework pragmatic to the core; it is designed such a way to enable the learners implementing the concepts to address the real world problems. A major emphasis of these frameworks is that the curriculum focuses on issues pertinent to India and also of the west; for example, biodiversity and conservation of endemic and threatened species that are found in India, Indian climatological variables, Indian biodiversity and so on. Above all, these frameworks are holistic and aim to mould responsible Indian citizen who have adequate skills in reflective thinking, rational skepticism, scientific temper, digital literacy and so on such that they are equipped to fight immediate social issues apropos to Indian milieu, including corruption and inequity.

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications such as a Bachelor's Degree (Hons) programmes are earned and awarded on the basis of (a) demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and (b) academic standards expected of graduates of a programme of study.

Learning outcomes-based frameworks in any subject must specify what graduates completing a particular programme of study are (a) expected to know, (b) understand and (c) be able to do at the end of their programme of study. To this extent, LOCF in Botany is committed to allowing for flexibility and innovation in (i) programme design and syllabi development by higher education institutions (HEIs), (ii) teaching-learning process, (iii) assessment of student learning levels, and (iv) periodic programme review within institutional parameters as well as LOCF guidelines, (v) generating framework(s) of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes. HEIs, on their turn, shall address to the situations of their students by identifying relevant and common outcomes and by developing such outcomes that not only match the specific needs of the students but also expands their outlook and values.

NATURE AND EXTENT OF BACHELOR'S DEGREE PROGRAMME IN BOTANY (HONOURS):

A bachelor's degree in Botany with Research or without Research is a 4 year degree course which is divided into 8 semesters.

Sl. No.	NCRF Credit Levels	Type of Award	Stage of Exit	Mandatory Credits to be secured for the Award
1	4.5	Certificate in the Discipline	After successful completion of 1st Year	44
2	5.0	Diploma in the Discipline	After successful completion of 1st and 2nd Years	88
3	5.5	B.Sc. Degree in Botany	After successful completion of 1st, 2nd and 3rd Years	132
4	6.0	B.Sc. (Honours with Research) / (without Research) in Botany	After successful completion of 1st, 2nd, 3rd and 4th Years	176

A student pursuing 4 years undergraduate programme with research in a specific discipline shall be awarded an appropriate Degree in that discipline on completion of 8th Semester if he/she secures 176 Credits. Similarly, for certificate, diploma and

degree, a student needs to fulfil the associated credits. An illustration of credits requirements in relation to the type of award is illustrated as above.

Bachelor's Degree (Honours) is a well-recognized, structured, and specialized graduate level qualification in tertiary, collegiate education. The contents of this degree are determined in terms of knowledge, understanding, qualification, skills, and values that a student intends to acquire to look for professional avenues or move to higher education at the postgraduate level.

Bachelor's Degree (Honours) programmes attract entrants from the secondary level or equivalent, often with subject knowledge that may or may not be directly relevant to the field of study/profession. Thus, B.Sc. (Honours) Course in Botany aims to equip students to qualify for joining a profession or to provide development opportunities in particular employment settings. Graduates are enabled to enter a variety of jobs or to continue academic study at a higher level.

AIMS:

1. To transform curriculum into outcome-oriented scenario.
2. To develop the curriculum for fostering discovery-learning.
3. To equip the students in solving the practical problems pertinent to India.
4. To adopt recent pedagogical trends in education including e-learning, flipped class, hybrid learning and MOOCs
5. To mold responsible citizen for nation-building and transforming the country towards the future.
6. To provide an environment that ensures cognitive development of students in a holistic manner. A dialogue about plants and its significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects.
7. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A Botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
8. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
9. To enable the graduate prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination.

PROGRAM LEARNING OUTCOMES:

The student graduating with the Degree B.Sc. (Honours) Botany should be able to acquire

PO 1: Knowledge: Students will acquire core competency in the subject Botany, and in allied subject areas. The student will be able to identify major groups of plants and compare the characteristics of lower (e.g. algae and fungi) and higher (angiosperms and gymnosperms) plants.

- Students will be able to use the evidence based comparative botany approach to explain the evolution of organism and understand the genetic diversity on the earth.
- The students will be able to explain various plant processes and functions, metabolism, concepts of gene, genome and how organism's function is influenced at the cell, tissue and organ level.
- Students will be able to understand adaptation, development and behavior of different forms of life.
- The understanding of networked life on earth and tracing the energy pyramids through nutrient flow is expected from the students.
- Students will be able to demonstrate the experimental techniques and methods of their area of specialization in Botany.

PO 2: Critical Thinking and problem solving ability: An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course. Students will become critical thinker and acquire problem solving capabilities.

PO 3: Digitally equipped: Students will acquire digital skills and integrate the fundamental concepts with modern tools.

PO 4: Ethical and Psychological strengthening: Students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses.

PO 5: Team Player: Students will learn team workmanship in order to serve efficiently institutions, industry and society.

PO 6: Independent Learner: Apart from the subject specific skills, generic skills, especially in botany, the program outcome would lead to gain knowledge and skills for further higher studies, competitive examinations and employment. Learning outcomes based curriculum would ensure equal academic standards across the country and

broader picture of their competencies. The Bachelor program in Botany and Botany honours may be mono-disciplinary or multidisciplinary.

SALIENT FEATURES:

- B.Sc. (Honours) Botany in UG programme - **Semester I and II** shall be offered from the Academic year, June **2023**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2023-24.
- A student will have to get enrolled a **Discipline Specific Core Course (DSC)** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting a **Multi/ Inter disciplinary Course (MDC/ IDC), Ability Enhancement Course (AEC), Skill Enhancement Course (SEC)** as well as **Value Added Course (VAC)/Indian Knowledge System (IKS)** from a pool of courses.
- ***Academic Bank of Credits (ABC)*** is an academic service mechanism as a digital/virtual/online entity established and managed by MOE/UGC. This will facilitate students to become its academic account holders and paving the way for seamless student mobility between or within degree-granting Higher Education Institutions (HEIs) through a formal system of credit recognition, credit accumulation, credit transfers and credit redemption to promote distributed teaching- learning from various recognized institutions, approved ODL and other sources to increase their knowledge, capacities and skills. ABC shall be established on the lines of "National Academic Depository" (NAD) as a Special Purpose Vehicle (SPV). It shall have a dynamic website providing all details of ABC, operational mechanism for the use of all stakeholders of higher education.
- Each course shall be assigned a specific number of **Credits**.
- Discipline Specific Core Course **(DSC)** is the course which should compulsorily be studied by a candidate as a Major and Minor requirement so as to get degree in a said discipline of study.
- There shall be a **Major (MJDSC) Compulsory** course (Theory) with **4 credits** and their practical's with **4 (Group A: 2+ Group B: 2) credits**.
- One **Minor (MiDSC) Compulsory** course and **Multi/ Inter disciplinary Course (MDC/ IDC)** (Theory) each with **2 credits** in each semester and their practical's each with **2 credits**.

- In addition to the Major/Minor course, a student will have to choose **MDC/IDC, AEC, SEC** as well as **VAC/IKS** from a pool of courses.
- **AEC, SEC** and **VAC/IKS** courses shall have to be offered. The credit weight-age for **AEC, SEC, VAC/IKS** course shall be of **2 credits**.
- Each course shall have a unique Course code. The Discipline Specific Core Course, Inter/Multi-Disciplinary Course, Ability Enhancement Course, Value Added Course and Skill Enhancement Course shall be abbreviated respectively as **DSC, IDC/MDC, AEC, VAC/IKS and SEC.**

1. Discipline Specific Core Course DSC- Major **(MJDSC) &** Minor **(MiDSC)**
   Practical Discipline Specific Core Course **PDSC- PMJDSC & PMiDSC.**
2. Multi/Inter Disciplinary Course **MDC/IDC**
   Practical Multi/Inter Disciplinary Course **PMDC/PIDC**
3. Ability Enhancement Course **AEC**
4. Skill Enhancement Course **SEC**
5. Value Added Course **VAC**
6. Indian Knowledge System **IKS**

- Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to **90 working days**. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.
- The theory course with **4 credits** shall be of **60 hrs** (15 weeks x 4 credits) duration and the course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.
- The **Practical** course **with 4 credits** shall be of **120 hrs** (15 weeks x 8 hours) duration and the **Practical** course **with 2 credits** shall be of **60 hrs** (15 weeks x 4 hours) duration.

GENERAL FRAMEWORK:

- *A general framework for Bachelor of Science (B. Sc.) with Honours programme with Research/without Research shall be as follows:*

Semester wise credits								Total credits of the Programme
I	II	III	IV	V	VI	VII	VIII	
22	22	22	22	22	22	22	22	176

SEMESTER WISE WEIGHTAGE:

- *The semester wise weightage of major, minor, multi/inter disciplinary, AEC, SEC and VAC/IKS shall be as follows:*

Academic year	Core Compulsory Courses	Multi/ Inter Disciplinary courses	Ability Enhancement Course	Skill Enhancement Course	Value Added Course
Semester I & II	8% to 46%	3% to 16 %	0% to 9%	0% to 9%	(IKS) 0% to 9%
Semester III	14% to 41%	3% to 15%	0% to 9%	0% to 9%	0% to 9%
Semester IV	17% to 56%	-	0% to 9%	0% to 9%	0% to 9%
Semester V	19% to 72%	-	-	0% to 9%	-
Semester V I	17% to 56%	-	0% to 9%	0% to 18%	-
Semester VII & VIII	**Major**	**With Research or without Research (RP/OJT)**			
	18% to 56%	0% to 26%			

ATTENDANCE:

The attendance rules as per the norms of Hemchandracharya North Gujarat University, Patan.

MEDIUM OF INSTRUCTION:

The Medium of Instruction shall be of **Gujarati medium**. Student is free to write answers either in **Gujarati** and/or **English** language.

TEACHING LEARNING PROCESS:

Teaching and learning in this programme involve classroom lectures as well tutorials. It allows-

- The tutorials allow a closer interaction between the students and the teacher as each student gets individual attention.
- Written assignments and projects submitted by students
- Project-based learning
- Group discussion
- Home assignments
- Quizzes and class tests
- PPT presentations, Seminars, interactive sessions
- Diversity survey
- Co-curricular activity etc.
- Industrial Tour or Field visit

LANGUAGE OF QUESTION PAPER:

Question paper should be drawn in **Gujarati** language and its **English** version should be given.

EVALUATION METHODS:

Academic performance in various courses *i.e.* **MJDSC, MiDSC, MDC/IDC, AEC, SEC, VAC/IKS** and **RP/OJT** are to be considered as parameters for assessing the achievement of students in the Botany subject. A number of appropriate assessment methods of Botany will be used to determine the extent to which students demonstrate desired learning outcomes.

Following assessment methodology should be adopted:

1. A student shall be evaluated through **Continuous and Comprehensive Evaluation (CCE)/ (*Internal Evaluation*)** and as well as the **Semester End Evaluation (SEE)** (***External Evaluation***). The weightage of theory and practical is ***25 marks per credit***. **CCE** shall be **50%**, whereas the weightage of the **SEE** shall be **50%**.

Sr. No.	Evaluation	4 credits subjects (Marks)	2 credits subjects (Marks)
1	**CCE (50%)** Classroom & Mid-Term Evaluation	50	25
2	**SEE (50%)**	50	25
	Total	**100**	**50**

2. In the **Continuous and Comprehensive Evaluation (CCE)/ (Internal Evaluation)** is spread through the duration of the course and is to be done by the Teacher teaching the course. BoS of the subjects will decide various criteria and their weight-age for CCE. The assessment is to be done by various means including:

Written Mode	Oral Mode	Practical Mode	Integrated Mode
1. Semester Exam 2. Class Test 3. Open book exam/test 4. Open note exam/test 5. Self-test/ Online test 6. Essay/Article writing 7. Quizzes/Objective test 8. Class assignment 9. Home assignment 10. Reports Writing 11. Research/Dissertation 12. Case Studies	1. Viva/Oral exam 2. Group Discussion 3. Role Play 4. Authentic Problem Solving 5. Quiz 6. Interview	1. Lab work 2. Computer simulation/ Virtual labs 3. Craft work 4. Co-curricular work	1. Paper presentation/ Seminar 2. Field Assignment 3. Poster presentation

NATURE AND OBJECTIVES OF VARIOUS TYPES OF EVALUATION:

Written Mode		
Evaluation Type	Nature	**Objectives**
Semester Exam	Traditionally essay type	For depth and planned preparation
Class test	Traditionally essay type	Fixed date forces students to learn
Open book test	Allowed choice of reference book	Measures what students can do with resources, less stress on
Open note test	To get used to the system	Encourage good note taking
Self-test	For subjective and objective items	Mastery learning occurs with proper feedback
Article/essay writing	Individual long written assignment	Individual expression and creativity
Quizzes/Objective test	Short duration structured test	Excellent validity as greater syllabus coverage
Class assignment	With defined time	Student's performance to make decision
Home assignment	With undefined time	Reinforce learning and facilitate mastery of specific skills
Reports Writing	On activities performed or event observed	Develop a key transferable skill
Research/Dissertation	Detailed research-based report	To judge creativity and research
Case Studies	**Analyse a given case (real or fictional)**	To assess thinking, value, and attitude

Oral Mode		
Evaluation Type	**Nature**	**Objectives**
Viva/Oral exam	Individually or in small group	Practical experience towards job interview situation
Group discussion	Small group of 2-5 members work on a joint task	Encourage teamwork
Role Play	Small group of 2-5 members work on a joint task	Develop personality
Authenticate problem solving	Small group of 2-5 members work on a joint task	Communication of ideas
Quiz	Small group of 2-5 members work on a joint task	Assess memory power
Interview	Individually	Judge the personal confidence level

Practical Mode		
Evaluation Type	**Nature**	**Objectives**
Lab work	Component of working with one's hand	Keep the students on the task
Computer simulation/virtua	Component of working with one's hand	To understand the practical exposure
Craft work	Component of working with one's hand	Encourage application of concepts learnt
Co-curricular work	Component of working with one's hand	For immediate feedback

Integrated Mode		
Evaluation Type	**Nature**	**Objectives**
Paper presentation/ Seminar	Group or individual work	Learn from others presentation
Field Assignment	Field visit with report	Develop observation and recording skills
Poster presentation	Group or individual work	Develop research, creativity, and discussion skills

MODELS OF EVALUATION:

Based on the types of evaluation, various models of evaluation implementation are suggested for theory, practical, self-study and work-based learning. The focus of these models is to encourage the students to improve on skills and performance.

Model for Theory Courses	
CCE- 50% (100)	**SEE- 50% (100)**
Exam Pattern	**Marks**
Class Test (best 2 out of 3)	30
Quiz (Best 3 out of 4)	30
Active Learning	10
Home Assignment	10
Class Assignment	10
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	100
Semester-End Evaluation (SEE)	100
Model for Project/Self Model for Project/Self-study course-study/ work	
Exam Pattern	**Marks**
Project Evaluation (Best 4 out of 5)	80
Participation in discussion	10
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	100
Semester-End Evaluation(SEE)	100

13. CCE and SEE shall be of 2 ½ hours for 4 credits course and 2 hours in case of 2 credits courses.

14. ***CERTIFIED JOURNAL:***

    The End of Semester Examination will be conducted by the University. A ***certified journal*** of the respective practical course **must be produced** at the time of practical examination by the student.

15. It will be compulsory for a candidate to obtain ***passing percentage*** in both Internal as well as External Evaluation. The passing marks for each course shall be **40%** as decided by concern Board of Studies (BoS) in Botany.

16. Promotion, Re-Admission and Time for Completion of course, Procedure for awarding grades, Provision for appeal, etc. as decided by the ***Hemchandracharya North Gujarat University***.

STUDY TOUR:

Botanical excursion/study tour may be arranged (by the concern faculty with prior permission of **HoD and/or Principal**) within state and/or outside the state to explore/study plant diversity in its natural habitats.

COMPUTATION OF SGPA:

SGPA is computed from the grades as a measure of the student's performance in each semester. It is the ratio of the sum of the product of the number of credits with the grade points and the sum of the number of credits. i.e.

$$\mathbf{SGPA\ (Si) = \sum (Ci\ X\ Gi) / \sum Ci}$$

Where Si is the SGPA for ith course, Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

CUMULATIVE GRADE POINT AVERAGE (CGPA)

The CGPA is based on the grades in all the courses taken after joining the programme of study. It is the ratio of the sum of the products of total credits scored in a particular semester with the SGPA scored by the student in that semester and the sum of the total number of credits of each semester. i.e.

$$\mathbf{CGPA = \sum (Ci\ X\ Si) / \sum Ci}$$

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

CERTIFICATE COURSE								
Part/Class	Subject code	Study Components	Instruction Hrs/Week	Examination			Credits	Exam Duration (Hours)
				CCE	SEE	Total		
B.Sc. Semester -I		**Semester-I**						
		Discipline Specific Core Course(DSC)						
	SC23MJDSCBOT101	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	**02:30**
	SC23MiDSCBOT102	Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	**02:00**
	SC23MDCBOT103	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	**02:00**
		Practical Course(PDSC)						
	SC23PMJDSCBOT101 (Group A+B)	Major Discipline Specific Core Courses (PMJDSC)	8	50	50	100	4	**05:00**
	SC23PMiDSCBOT102	Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	**02:30**
	SC23PMDCBOT103	Multi/Inter Disciplinary Courses (PMDC/PIDC)	4	25	25	50	2	**02:30**
		Ability Enhancement Course (AEC)						
	SC23AECBOT104	Ability Enhancement Courses (AEC) **(**Languages)	2	25	25	50	2	**02:00**
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
	SC23IKSBOT105	Indian Knowledge System (IKS)	2	25	25	50	2	**02:00**
		Skill Enhancement Course (SEC)						
	SC23SECBOT106	Skill Enhancement Course (SEC)	2	25	25	50	2	**02:00**
			30	**275**	**275**	**550**	**22**	
B.Sc. Semester -II		**Semester-II**						
		Discipline Specific Core Course(DSC)						
	SC23MJDSCBOT201	Major Discipline Specific Core Courses (MJDSC)	4	50	50	100	4	**02:30**
	SC23MiDSCBOT202	Minor Discipline Specific Core Courses (MiDSC)	2	25	25	50	2	**02:00**
	SC23MDCBOT203	Multi/Inter Disciplinary Courses (MDC/IDC)	2	25	25	50	2	**02:00**
		Practical Course(PDSC)						
	SC23PMJDSCBOT201 (Group A+B)	Major Discipline Specific Core Courses (PMJDSC)	8	50	50	100	4	**05:00**
	SC23PMiDSCBOT202	Minor Discipline Specific Core Courses (PMiDC)	4	25	25	50	2	**02:30**
	SC23PMDCBOT203	Minor Discipline Specific Core Courses (PMiDSC)	4	25	25	50	2	**02:30**
		Ability Enhancement Course (AEC)						
	SC23AECBOT204	Ability Enhancement Courses (AEC) **(**Languages)	2	25	25	50	2	**02:00**
		Value Added Course (VAC)/ Indian Knowledge System (IKS)						
	SC23VACBOT205	Value Added Courses (VAC)	2	25	25	50	2	**02:00**
		Skill Enhancement Course (SEC)						
	SC23SECBOT206	Skill Enhancement Course (SEC)	2	25	25	50	2	**02:00**
			30	**275**	**275**	**550**	**22**	

OPTION I BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
NCrF Credit Level	**Sem-ester**	**Major (Core) (72/ 116)**	**Minor (Electives) (32)**	**Multi/ Inter-disciplinary (10)**	**AEC (10)**	**SEC/ Internship (12)**	**VAC/ IKS (8)**	**RP/ OJT**	**Total Credits/ Sem. (144/176)**	**Qualification / Certificate**
Level		100	100	1 course	1 course	1 course	1 or 2 course	-	-	
4.5 1st Year	**I**	8	4	4	2	2 (SEC)	2 (IKS)	-	22	**UG Certificate**
	II	8	4	4	2	2 (SEC)	2 (VAC)	-	22	
1st Year Total Credits		**16**	**8**	**8**	**4**	**4**	**4**	**-**	**44**	
Exit 1: Award of UG certificate in Major course with 44 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for next NCrF credit level										
Level		200	(200 & above)	1 course	1 course	1 course	1 or 2 course	-	-	
5.0 2nd Year	**III**	12	-	4	2	2 (SEC)	2 (IKS)	-	22	**UG Diploma**
	IV	12	4	-	2	2 (SEC)	2 (VAC)	-	22	
2nd Year Total Credits		**40**	**12**	**12**	**8**	**8**	**8**	**-**	**88**	
Exit 2: Award of UG Diploma in Major course with 88 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for next NCrF credit level										
Level		300	(200 & above)	-	1 course	1 course	-	-	-	
5.5 3rd Year	**V**	12	8	-	-	2 (SEC)	-	-	22	**UG Degree**
	VI	12	4	-	2	4(Internship)	-	-	22	
3rd Year Total Credits		**64**	**24**	**12**	**10**	**14**	**8**	**-**	**132**	
Award of UG Degree in Major course with 132 credits and Internship in core discipline OR continue with Major and Minor course for next NCrF credit level										
Level		400	(300 & above)							
6.0 4th Year	**VII**	12	4	-	-	-	-	6 (OJT)	22	**UG Honours Degree**
	VIII	12	4	-	-	-	-	6 (OJT)	22	
4th Year Total Credits		**88**	**32**	**12**	**10**	**14**	**8**	**12**	**176**	
Award of UG Honours Degree in Major (without Research)course with total 176 credits										
OPTION II BACHELOR'S DEGREE WITH HONOURS (WITH RESEARCH)										
6.0	**VII**	12	4	-	-	-	-	6 (RP)	22	**UG Honours with Research Degree**
	VIII	12	4	-	-	-	-	6 (RP)	22	
4th Year Total Credits		**88**	**32**	**12**	**10**	**14**	**8**	**12**	**176**	
Award of UG Honours with Research Degree in Major course with total 176 credits										

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MAJOR DISCIPLINE SPECIFIC CORE COURSE 1-THEORY (MJDSC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.SC. II***	***SC23MJDSCBOT201***	***Biomolecules and Cell Biology***	**4**	**60 hrs**	***50 Marks***	***50 Marks***
Course outcomes :	After the completion of the course the students will be able to: 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. **Pedagogy:** Lectures, Tutorials, Assignments, Demonstrations, Videos, Team based learning.						
UNIT	***TOPIC***						***NO. OF LECTURES* (60hrs)**
Unit 1	**Biomolecules- I** • **Carbohydrates:** ➢ Definition, classification and significance. ➢ Structure and functions of Monosaccharides (trioses, pentoses and hexoses). ➢ Structure and functions of Disaccharides (maltose and sucrose). ➢ Structure and functions of Polysaccharides (cellulose). • **Lipids**: ➢ Definition, classification and significance ➢ Structure and functions of Fatty acids: Saturated and Unsaturated						**15**

	➢ Essential fatty acids ➢ **Simple and Conjugated Lipids:** Structure and functions of Triglycerides and waxes. Conjugated lipids with examples.	
Unit 2	**Biomolecules - II** • **Amino acids**: ➢ Definition and classification (based on polarity) ➢ Properties of amino acids. Peptide bond, Dipeptide and polypeptide. • **Proteins**: ➢ Definition, classification and significance ➢ General (Physical) properties of Proteins. Levels of protein structure-primary and secondary. • **Nucleic acids**: ➢ Definition, classification and significance. ➢ Structure of nitrogenous bases; Structure and function of nucleotides. ➢ Structure of DNA (Watson and Crick's model); Types of RNA.	**15**
Unit 3	**Cell Biology – I** • **Cell**: as a basic unit of structure and function, Characteristics and comparison of Prokaryotic and Eukaryotic cell. • **Cell wall:** Ultrastructure, chemical composition and functions. • **Plasma membrane:** Ultrastructure, chemical composition and functions, sandwich and fluid mosaic model. • **Nucleus:** Structure-nuclear envelope, nuclear lamina, molecular organization of chromatin.	**15**
Unit 4	**Cell Biology – II** • **Chloroplast:** Structural organization and Functions. • **Mitochondria:** Structural organization and Functions.	**15**

	• **Endoplasmic Reticulum:** Structural organization and Functions. • **Cell division:** Eukaryotic Cell Cycle, Mitosis, Meiosis and their significance	

Suggested Readings:

1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
2. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company
5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. 2009 The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MAJOR DISCIPLINE SPECIFIC CORE COURSE 1-PRACTICAL (PMJDSC)

PROGRAMME CODE: SCIUG103

COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*			
				Credits	*Lectures*	*CCE*	*SEE*
Certificate Course	*B.Sc. II*	*SC23PMJDSCBOT201*	*Biomolecules and Cell Biology*	**4(2+2) (GROUP: A+ B)**	**120hrs**	*50 Marks*	*50 Marks*

Course outcomes:

After the completion of the course the students will be able to:

1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged.
2) This will provide inside into the organization of cell, its features and regulation at different levels.
3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life.

Pedagogy: Lectures, Tutorials, Assignments, Demonstrations, Videos, Team based learning.

PRACTICALS	***NO. OF LECTURES* (120 hrs)**
GROUP A	
1) Preparation of solutions and plant juices to determine their pH using Universal indicator/pH meter. 2) Estimation of Free Fatty acids by titration method. 3) Bio-Molecules: Tests for detection of Carbohydrates: The following tests are to be performed to detect the nature of carbohydrates available in the supplied sample (Glucose, Fructose, Maltose & Sucrose). 1. Molisch's test, 2. Benedict's test, 3. Barfoed's test, 4. Seliwanoff's test, 5. Iodine test, 6. Cobalt chloride test. 4) Akaryota - Bacteriophage, Prokaryota - Cyanophycean cell & Eukaryota - typical Animal & Plant cell.	**60**

GROUP B	
1) Tests for detection of Lipids *i.e.,* Fats and Oils: Micro-chemical tests on sections of Plant materials- Sudan III stain, Solubility test. 2) Tests for detection of Proteins: Biuret test/Xanthoprotic test. 3) Study of mitosis from onion root tip using squash method. 4) To study the various types of cell organelles through micrographs / charts (As per theory syllabus). 5) Study of different stages of meiosis, structure of DNA (Watson and Crick's model) and Types of RNA (Chart/Permanent Slides).	**60**

Suggested Readings:

1. Campbell, M.K. (2012). Biochemistry, 7th ed., Published by Cengage Learning.
2. Campbell, P.N. and Smith, A.D. (2011). Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone.
3. Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012). Biochemistry: A short course, 2nd ed., W.H.Freeman.
4. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2011). Biochemistry, W.H. Freeman and Company.
5. Nelson, D.L. and Cox, M.M. (2008). Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. SC. :: BOTANY (MAJOR) PRACTICAL:: SEMESTER-II

PROGRAMME CODE: SCIUG103

BIOMOLECULES AND CELL BIOLOGY

SC23PMJDSCBOT201

Date: *Place:*

Time: 5 Hrs **Total Marks: 50**

Instructions: Strictly follow the instructions given by examiner(s).

GROUP A

1. Measure the pH of the given sample **A**. Mention its nature and show it to the examiner. **04**

2. Perform tests for detection of organic molecule (Carbohydrates) in given solution **B**. Show your result to the examiner. **08**

3. Identify and describe as per given instructions: **06**

   Specimen –**C**: Type of Cell: Prokaryotic/Eukaryotic-Chart/Permanent Slide.

   (5 minute)

   Specimen – **D**: Sandwich model/Fluid Mosaic Model – Chart. (5 minute)

4. a. *Viva-voce* **03**

   b. Journal **04**

GROUP B

1. Perform tests for detection of organic molecule (Lipid/Protein) in given solution **E**. Show your result to the examiner. **06**

2. Prepare a temporary mounting of Mitosis from given material **F**. Using squash method. Show stage(s) of cell division to the examiner with diagram(s). **06**

3. Identify and describe as per given instructions: **06**

   1) Specimen – **G**: Cell wall/ ER/Nucleus/ Chloroplast/Mitochondria– Chart/PS. (5 minute)

   2) Specimen – **H**: DNA Model/types of RNA/ any stage of meiosis. (5 minute)

4. a. *Viva-voce* **03**

   b. Journal **04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MINOR DISCIPLINE SPECIFIC CORE COURSE 1-THEORY (MiDSC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.SC. II***	***SC23MiD SCBOT 202***	***ORGANIC MOLECULES AND CYTOLOGY***	**2**	**30 hrs**	***25 Marks***	***25 Marks***
Course outcomes :	After the completion of the course the students will be able to: 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. **Pedagogy:** Lectures, Tutorials, Assignments, Demonstrations, Videos, Team based learning.						
UNIT	***TOPIC***						***NO. OF LECTURES*** **(30hrs)**
Unit 1	• **Carbohydrates:** ➢ Definition, classification and significance. ➢ Structure and functions of Monosaccharides (trioses, pentoses and hexoses). ➢ Structure and functions of Disaccharides (maltose and sucrose). ➢ Structure and functions of Polysaccharides (cellulose). • **Lipids**: ➢ Definition, classification and significance ➢ Structure and functions of Fatty acids: Saturated and unsaturated						**15**

	➢ Essential fatty acids ➢ **Simple and Conjugated Lipids:** Structure and functions of Triglycerides and waxes. Conjugated lipids with examples.	
Unit 2	**Cell Biology – II** • **Chloroplast:** Structural organization and Functions. • **Mitochondria:** Structural organization and Functions. • **Endoplasmic Reticulum:** Structural organization and Functions. • **Cell division:** Eukaryotic Cell Cycle, Mitosis, Meiosis and their significance	**15**

Suggested Readings:

1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
2. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company
5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. 2009 The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MINOR DISCIPLINE SPECIFIC CORE COURSE 1-PRACTICAL (MiDSC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. II***	***SC23PMiDSCBOT201***	***ORGANIC MOLECULES AND CYTOLOGY***	**2**	**60hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able to: 1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged. 2) This will provide inside into the organization of cell, its features and regulation at different levels. 3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life. **Pedagogy:** Lectures, Practicals, Tutorials, Assignments, Demonstrations, Videos, Team based learning.						
UNIT	***TOPIC***					***NO. OF LECTURES*** **(60 hrs)**	
Unit 1	1) Preparation of solutions and plant juices to determine their pH using Universal indicator/pH meter. 2) Estimation of Free Fatty acids by titration method. 3) Bio-Molecules: Tests for detection of Carbohydrates: The following tests are to be performed to detect the nature of carbohydrates available in the supplied sample (Glucose, Fructose, Maltose & Sucrose). 1. Molisch's test, 2. Benedict's test, 3. Barfoed's test, 4. Seliwanoff's test, 5. Iodine test, 6. Cobalt chloride test.					**30**	

	4) Tests for detection of Lipids *i.e.,* Fats and Oils: Micro-chemical tests on sections of Plant materials- Sudan III stain, Solubility test.	
Unit 2	1) To study the various types of cell organelles through micrographs / charts (As per theory syllabus). 2) Study of mitosis from onion root tip using squash method. 3) Study of different stages of meiosis (Chart/Permanent Slides).	**30**

Suggested Readings:

1. Campbell, M.K. (2012). Biochemistry, 7th ed., Published by Cengage Learning.
2. Campbell, P.N. and Smith, A.D. (2011). Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone.
3. Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012). Biochemistry: A short course, 2nd ed., W.H.Freeman.
4. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2011). Biochemistry, W.H. Freeman and Company.
5. Nelson, D.L. and Cox, M.M. (2008). Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. Sc. :: BOTANY (MINOR) PRACTICAL:: SEMESTER-II

PROGRAMME CODE: SCIUG103

MOLECULES AND CYTOLOGY

SC23PMiDSCBOT202

(CREDIT 2)

Date: ***Place:***

Time: 02:30 Hrs **Total Marks: 25**

Instructions: Strictly follow the instructions given by examiner(s).

1. Measure the pH of the given sample **A**. Mention its nature and show it to the examiner. **03**
2. Perform tests for detection of organic molecule (Carbohydrates/Lipid) in given solution **B**. Show your result to the examiner. **05**
3. Prepare a temporary mounting of Mitosis from given material **C**. Using squash method. Show stage(s) of cell division to the examiner with diagram(s). **05**
4. Identify and describe as per given instructions: **06**
   1) Specimen – **D**: ER/Nucleus/ Chloroplast/Mitochondria– Chart/PS. (5 minute)
   2) Specimen – **E**: Any one stage of meiosis – Chart/PS. (5 minute)
5. a. *Viva-voce* **03**

   b. Journal **03**

DETAILED SYLLABUS OF B.Sc. FIRST YEAR FOR CERTIFICATE COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2023-24 UNDER NEP-2020)

MULTI/INTER DISCIPLINARY COURSE-THEORY (MDC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. II***	***SC23MDC BOT203***	***FRUITS AND VEGETABLE PROCESSING***	**2**	**30hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able to: 1) This course is designed to give an overview of different types of fruits and vegetables, their composition and methods used in processing and preservation. 2) The practical component of this course deals with imparting skills in preparation of various processed products. **Pedagogy:** Lectures, Practicals, Assignment, Presentations, Field visit.						
UNIT	***TOPIC***						***NO. OF LECTURES* (30hrs)**
Unit 1	• **Fruits and Vegetables: Methods of processing and processed products** ➢ Fruits - Definition, types of fruits (fleshy and dry) with examples. ➢ Vegetables - Definition, types of vegetables (leafy, stem, root, flower and fruit) with examples. • **Principles of processing and preservation.** ➢ Methods of processing: Drying, pickling, fermentation, freezing and dehydration, canning. ➢ Scope and importance of processing and preservation.						**15**
Unit 2	• **Preparation of the following products:** ➢ Frozen vegetables - Carrots (*Daucus carota*) - Pea (*Pisum sativum*). ➢ Dehydrated products - Potato (*Solanum tuberosum*) chips and Garlic (*Allium sativum*) powder.						**15**

	➢ Preparation of pickles from fruits - Mango and Lemon. ➢ Juices & Squashes - Amla (*Phyllanthus emblica*) juice, Kokum (*Garcinia indica*) juice.	

Suggested Readings:

1. Ashraf, SM (2008). Handbook of Fruit and Vegetable products. Agrobios, India.
2. Cruess, WV (2004). Commercial Fruit and Vegetable Products. Agrobios, India.
3. Dubey, RC (1993). A Textbook of Biotechnology. S. Chand & Company Pvt. Ltd., New Delhi.
4. Frazier, WC and Westhoff, DC (2008). Food Microbiology. Tata Mc. Graw Hill Education Private Limited, New Delhi.
5. Lal G, Siddappa, GS & Tandon, GL (2019). Preservation of fruits & Vegetables. ICAR, New Delhi.
6. Manay, SN and Shadaksharaswamy, M (2008). Foods: Facts and Principles. New Age International, Bengaluru.
7. Narang, RK (2010). Fruit and Vegetable Preservation Techniques. APH Publishing Corporation, Delhi.
8. Potter, NN and Hotchkiss, HJ (1996). Food Science. CBS Publishers & Distributors, New Delhi.
9. Rahman, MS (2020). Handbook of food preservation (3rd Edition). CRC-press, United States.
10. Ranganna, S (1986). Handbook of analysis and quality control for fruits and vegetable products (2nd Edition). Tata Mc Graw-Hill Publishing Company Limited, New York.
11. Saldanha, E (2010). Successful Goan home wines. Rajhauns Vitaran, Goa.
12. Srilakshmi, B (2007). Food Science. New Age International (P) Limited, New Delhi.
13. Srivastava, RP and Kumar, S (2017). Fruit and Vegetable Preservation- Principles and Practices (3rd edition). CBS publishers and distributors Pvt Ltd., India.
14. Thompson, AK (2003). Fruit and Vegetables - Harvesting, Handling and Storage (2nd Edition). Blackwell Publishing Ltd., US.
15. Verma, LR and Joshi, VK (2000). Post harvest technology of Fruits and vegetables- handling, processing, fermentation, and waste management. Vol I & II, Indus Publishing, New Delhi.
16. Wolff, IA (1982). CRC Handbook of Processing and Utilization in Agriculture. CRC series in Agriculture, Vol II, part-I, CRC press, California.

MULTI / INTER DISCIPLINARY COURSE-PRACTICAL(PMDC) ***PROGRAMME CODE: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. II***	***SC23PMDCBOT 203***	***FRUITS AND VEGETABLE PROCESSING***	**2**	**60hrs**	***25 Marks***	***25 Marks***
Course outcomes:	After the completion of the course the students will be able to: On completion of this course students will be able to: 1) Recall the types of fruits and vegetables used for processing. 2) Explain the principles of fruits and vegetable processing. 3) Analyse the different methods used in processing of fruits and vegetables. 4) Apply the skills in preparation of various processed products for entrepreneurial opportunity. **Pedagogy:** Lectures, Practicals, Assignment, Presentations, Field visit.						
UNIT	***TOPIC***					***NO. OF LECTURES*** **(60hrs)**	
Unit 1	1. Study of fruits (banana, mango, papaya, pineapple, cashew), their composition and use in value-added products. 2. Study of Vegetables (Cucumber, tomato, ladyfinger, radish and brinjal), their composition and use in value-added products. 3. Determination of pH of any Citrus fruit. 4. Preparation of any one type of pickle. 5. Preparation of fruit juice and squash.					**30**	
Unit 2	1. Preparation of tutti fruity from raw papaya. 2. Preservation of green peas and carrots by freezing. 3. Preparation of amla and ginger candy. 4. Preparation of chutney from fruit and vegetable. 5. Field visit to a distillation unit or a food processing unit.					**30**	

Suggested Readings:

1. Ashraf, SM (2008). Handbook of Fruit and Vegetable products. Agrobios, India.
2. Cruess, WV (2004). Commercial Fruit and Vegetable Products. Agrobios, India.
3. Dubey, RC (1993). A Textbook of Biotechnology. S. Chand & Company Pvt. Ltd., New Delhi.
4. Frazier, WC and Westhoff, DC (2008). Food Microbiology. Tata Mc. Graw Hill Education Private Limited, New Delhi.
5. Lal G, Siddappa, GS & Tandon, GL (2019). Preservation of fruits & Vegetables. ICAR, New Delhi.
6. Manay, SN and Shadaksharaswamy, M (2008). Foods: Facts and Principles. New Age International, Bengaluru.
7. Narang, RK (2010). Fruit and Vegetable Preservation Techniques. APH Publishing Corporation, Delhi.
8. Potter, NN and Hotchkiss, HJ (1996). Food Science. CBS Publishers & Distributors, New Delhi.
9. Rahman, MS (2020). Handbook of food preservation (3rd Edition). CRC-press, United States.
10. Ranganna, S (1986). Handbook of analysis and quality control for fruits and vegetable products (2nd Edition). Tata Mc Graw-Hill Publishing Company Limited, New York.
11. Saldanha, E (2010). Successful Goan home wines. Rajhauns Vitaran, Goa.
12. Srilakshmi, B (2007). Food Science. New Age International (P) Limited, New Delhi.
13. Srivastava, RP and Kumar, S (2017). Fruit and Vegetable Preservation- Principles and Practices (3rd edition). CBS publishers and distributors Pvt Ltd., India.
14. Thompson, AK (2003). Fruit and Vegetables - Harvesting, Handling and Storage (2nd Edition). Blackwell Publishing Ltd., US.
15. Verma, LR and Joshi, VK (2000). Post harvest technology of Fruits and vegetables- handling, processing, fermentation, and waste management. Vol I & II, Indus Publishing, New Delhi.
16. Wolff, IA (1982). CRC Handbook of Processing and Utilization in Agriculture. CRC series in Agriculture, Vol II, part-I, CRC press, California.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2023-24 UNDER NEP-2020)

B. SC. :: BOTANY (MULTI/INTER DISCIPLINARY)PRACTICAL :: SEMESTER-II

PROGRAMME CODE: SCIUG103

FRUITS AND VEGETABLE PROCESSING

SC23PMDCBOT203

Date: **Place:**

Time: 02:30hrs **Total Marks: 25**

Instructions: Strictly follow the instructions given by examiner(s).

1. Determination of pH of any Citrus fruit from given sample **A**. Mention its nature and show it to the examiner. **05**
2. Identify and write information of given sample **B**. (their composition and use in value-added products). **04**
3. Preparation of fruit juice and squash from given sample **C**. **04**
4. Write method of preparation of any one type of pickle/chutney/ tutti fruity (as per syllabi). **03**
5. Write method of Preservation of green peas / carrots by freezing. **03**
6. a. *Viva-voce* **03**

   b. Journal **03**

SKILL ENHANCEMENT COURSE-(THEORY)(SEC)							
PROGRAMME CODE: SCIUG103							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***CCE***	***SEE***
Certificate Course	***B.Sc. II***	***SC23SEC BOT206***	***NATURAL RESOURCE MANAGEMENT***	**2**	**30 hrs**	***25 Marks***	***25 Marks***

Course outcomes:	After the completion of the course the students will be able: 1. Understand the importance, benefits and services of biodiversity. 2. To learn the strategies for the conservation of biodiversity. 3. This knowledge is critical in evolving strategies for sustainable natural resource management and biodiversity conservation. **Pedagogy:** Lectures, Practicals, Assignment, Presentations, Field visit.	
UNIT	***TOPIC***	***NO. OF LECTURES*** **(30 hrs)**
Unit 1	**NATURAL RESOURCE MANAGEMENT - I** • Natural Resource: Definition, types and management. • Sustainable utilization: Concept, approaches (economic, ecological and socio-cultural). • Land Utilization: (agricultural, pastoral, horticultural, silvicultural). • Soil degradation and management.	**15**
Unit 2	**NATURAL RESOURCE MANAGEMENT - II** • Fresh water: rivers, lakes, groundwater, aquifers, watershed. • Marine Water: Estuarine; Wetlands. • Forests: Definition, Cover and its significance (with special reference to India). • Major and minor forest products; Depletion; Management.	**15**

Suggested Readings:

1. Vasudevan, N. (2006). Essentials of Environmental Science. Narosa Publishing House, New Delhi.
2. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi.
3. Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc Programme (CBCS - Semester - Grading Pattern)
(Effective from June 2023-24 UNDER NEP-2020
B. Sc.:: BOTANY :: SEMESTER END EXAMINATION
PROGRAMME CODE: SCIUG103
FORMAT FOR QUESTIONS PAPER FOR 4 CREDITS COURSE IN BOTANY

(B.Sc. Sem. – I & II)

The university examination paper consists of four questions.

- First question is of 12 marks and will be from Unit – I.
- Second question is of 13 marks and will be from Unit – II.
- Third question is of 12 marks and will be from Unit – III.
- Fourth question is of 13 marks and will be from Unit – IV.

No. of Printed Pages:___

Name of Subject : BOTANY		**Paper Code : MJDSCBOT-101 & 201**
Name of Paper :		
Total Hours : 02:30 Hrs		**Total Marks : 50**
Instructions: (1) This question paper contains four questions. All questions are compulsory. (2) Figures at right side indicate the marks of question. (3) Illustrate your answer with labelled diagram.		
Que.1 (A)	**Describe in detail:(any one)** (1) (2)	**08**
(B)	**Describe in short:(any one)** (1) (2)	**04**
Que.2 (A)	**Describe in detail:(any one)** (1) (2)	**09**
(B)	**Describe in short:(any one)** (1) (2)	**04**
Que.3 (A)	**Describe in detail:(any one)** (1) (2)	**08**
(B)	**Describe in short:(any one)** (1) (2)	**04**
Que.4(A)	**Describe in detail:(any one)** (1) (2)	**09**
(B)	**Describe in short:(any one)** (1) (2)	**04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc Programme (CBCS - Semester - Grading Pattern)
(Effective from June 2023-24 UNDER NEP-2020
B. Sc.:: BOTANY :: SEMESTER END EXAMINATION
PROGRAMME CODE: SCIUG103
FORMAT FOR QUESTIONS PAPER FOR 2 CREDITS COURSE IN BOTANY

(B.Sc. Sem. – I & II)

The university examination paper consists of three questions.

- First question is of **10** marks and will be from **Unit – I.**
- Second question is of **10** marks and will be from **Unit – II.**
- Third question is of **05** marks and will be from **Unit – I & II.**

No. of Printed Pages:___

Name of Subject : BOTANY	**Paper Code :** **MiDSCBOT-102 & 202** **MDCBOT- 103 & 203** **AEC -104 & 204** **VAC/IKS- 105 & 205** **SECBOT- 106 & 206**
Name of Paper :	
Total Hours : 02:00 Hrs	**Total Marks : 25**

Instructions: (1) This question paper contains three questions.
(2) All questions are compulsory.
(3) Figures at right side indicate the marks of question.
(4) Illustrate your answer with labelled diagram.

		Marks
Que.1(A)	**Describe in Detail (any one).** (1) (2)	**06**
(B)	**Write short note (any one).** (1) (2)	**04**
Que.2(A)	**Describe in Detail (any one).** (1) (2)	**06**
(B)	**Write short note (any one).** (1) (2)	**04**
Que.3	**Do as direct (any five from seven).** (1) (2) (3) (4) (5) (6) (7)	**05**

Important Notifications and Guidelines released from UGC & Ministry of Education, Government of India for reference.

1. NEP-2020-English: From page No. 33-Major problems faced by the higher education system and key changes required in current education system (https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf)
2. Gujarati version of NEP-2020 (https://www.education.gov.in/sites/upload_files/mhrd/files/nep/2020/GUJARATI.pdf)
3. IKS in Higher Education Curricula: Details of course and curriculum of IKS which will be integral part of current education system (https://www.ugc.gov.in/pdfnews/6436045_Guidelines-IKS-in-HE-Curricula.pdf)
4. Training of faculty on IKS: Need and process of training of faculties on IKS (https://www.ugc.gov.in/pdfnews/3746302_Guidelines-for-TrainingOrientation-of-Faculty-on-Indian-Knowledge-System-(IKS).pdf)
5. Multiple Entry and Exit Options: The mechanism to adopt flexibility of multiple entry and exit in all HEIs to facilitate the students during academic cycle (https://www.ugc.gov.in/e-book/GL%20Multipe%20Entry%20Exit.pdf)
6. Apprenticeship/Internship: Objective, process and roles of HEIs and Industries to implement internship/apprenticeship (https://www.ugc.gov.in/pdfnews/9105852_ugc-guidelines_ApprenticeshipInternship.pdf)
7. Open and Distance Learning (ODL): Guideline, process, and eligible institutes to provide the ODL mode of learning. https://www.ugc.gov.in/pdfnews/7421799_Current-Regulations.pdf
8. Curriculum and Credit Framework: Suggestive points by UGC to design the course curriculum and define the credit structure (https://www.ugc.gov.in/pdfnews/7193743_FYUGP.pdf)
9. Academic Bank of Credits: Objective, function and implementation methodology of Academic Bank of Credits into HEIs https://www.ugc.gov.in/pdfnews/9327451_Academic-Bank-of-Credicts-in-Higher-Education.pdf)
10. Transforming Higher Education: Objective, approach and readiness of the institution to transform into multidiscipline institutions (https://www.ugc.gov.in/pdfnews/5599305_Guidelines-for-Transforming-Higher-Education-Institutions-into-Multidisciplinary-Institutions.pdf)
11. National Credit Framework: Assignment of credits, Implementation, and operationalization of credit framework through ABC https://www.ugc.gov.in/pdfnews/9028476_Report-of-National-Credit-Framework.pdf)
12. National Higher Education Qualification Framework: NHEQF level qualification specification and Course Learning Outcome (https://www.ugc.gov.in/pdfnews/9028476_Report-of-National-Credit-Framework.pdf)
13. Blended mode of Learning: Infrastructure readiness at HEIs, implementation process, assessment and evaluation and suggested framework for blended mode of learning. (https://www.ugc.gov.in/pdfnews/6100340_Concept-Note-Blended-Mode-of-Teaching-and-Learning.pdf)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Zoology

Syllabus/ scheme

Semester – 1 to 2

With effect from

June-2023

Date: 12/08/2023

Semester II

B. Sc. Semester II (Zoology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC ZOO201	Fundamentals of Zoology-II	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC ZOO202	Basics of Zoology-II	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC ZOO203	Introduction to Zoology-II	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC ZOO201	Fundamentals of Zoology-II Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Fundamentals of Zoology-II Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC ZOO202	Basics of Zoology-II Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC ZOO203	Introduction to Zoology-II Practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO204	English	2	25	25	50	2	2
Value added courses	SC23VAC ZOO205		2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO206	Practices of Livestock Based Farming	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCZOO201

FUNDAMENTALS OF ZOOLOGY-II

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 04 (04Period/Week)	**Theory**	**External-50 Marks**
		Internal- 50 Marks

Program Outcome:

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

Course Outcome:

1. The student shall have basic knowledge about general topics of genetics.
2. The student shall have basic knowledge about general topics of animal physiology
3. The student shall have basic knowledge about general topics of classification of kingdom Animalia.
4. The student shall have basic knowledge about classification of acoelomates and pseudocoelomates up to class level and the functional anatomy of typical representative/s of different phylums

Sr. No			**Credit**	**Hr**
1	**Unit-1**	• General characteristics and classification of phylum Mollusca (up to class) • Type study: *Pila* (habit and habitat, external features, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system) • General characteristics and classification of phylum Annelida (up to class) • General characteristics and classification of phylum Arthropoda (up to class)	**1**	**15**

2	**Unit-2**	• Type study: Cockroach (habit and habitat, external features, body wall, endoskeleton, locomotion, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system) • Useful and harmful insects • General characteristics and classification of phylum Echinodermata (up to class) • Type study: Star fish (habit and habitat, external features, water vascular system, digestive system) • General characteristics and classification of phylum Hemichordata (up to class)	**1**	**15**
3	**Unit-3**	• Introduction to gene concept (general structure of gene) • Introduction to Mendelian laws of Heredity: Mendel's monohybrid and dihybrid cross. • Incomplete dominance (e.g. *Mirabilis jalapa*) & Co-dominance (e.g. Roan cattle). • Multiple alleles e.g. ABO blood group system in humans & Rh factor- Erythroblastosis fetalis	**1**	**15**
4	**Unit-4**	• Definition and scope of Ecology • Importance and biological effect of abiotic factors (temperature and light) and biotic factors: producer, consumer, decomposers. Functions of ecosystem: food chain, food web, trophic levels, energy flow, ecological pyramids • Animal relationships: mutualism, commensalism, antagonism (antibiosis, parasitism, predation and competition) • Principle and function of ecological tools: sechi disc, anemometer, hygrometer, lux meter, rain gauge and thermometer • Pond ecosystem	**1**	**15**

Reference:

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition

2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

Further Reading:

1. Verma PS and Agrawal VK, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

2. Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23PMJDSCZOO201
FUNDAMENTALS OF ZOOLOGY-II PRACTICAL
EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits-04	**Part A: 2 credit**	**(04 Period/Week)**	**Internal- 25 Marks**	**External-25 Marks**	**Total marks: 100**
	Part B: 2 credit	**(04 Period/Week)**	**Internal- 25 Marks**	**External-25 Marks**	

PART A
List of Practicals

1. Study of classification of phylum Mollusca (up to class) using laboratory specimens, models, slides, charts (Chiton, Dentalium, Pila, Mitilus, Octopus).
2. Study of classification of phylum Annelida and Hemichordata (up to class) using laboratory specimens, models, slides, charts (Earthworm, Nereis, Leech, Balanoglossus).
3. Study of classification of phylum Arthropoda (up to class) using laboratory specimens, models, slides, charts (Peripatus, Limulus, Prawn, Spider, Centipede, Cockroach).
4. Study of classification of phylum Echinodermata (up to class) using laboratory specimens, models, slides, charts (Starfish, Brittle star, Sea urchin, Sea cucumber, Feather star).
5. Study of anatomy of digestive system of *Pila* using charts and models
6. Study of anatomy of nervous system of *Pila* using charts and models
7. Study of anatomy of reproductive system of *Pila* using charts and models
8. Study of anatomy of digestive system of Cockroach using charts and models
9. Study of anatomy of blood vascular system of Cockroach using charts and models
10. Study of anatomy of excretory system of Cockroach using charts and models
11. Study of anatomy of nervous system of Cockroach using charts and models
12. Study of anatomy of reproductive system of Cockroach using charts and models
13. Study of anatomy of digestive system of star fish using charts and models
14. Study of anatomy of water vascular system of star fish using charts and models
15. Mounting of mouth parts of housefly, honey bee and mosquito.
16. Study of respiratory spiracles of cockroach and radula of Pila.

PART B

List of Practicals

1. To solve genetic problem: Mendel's monohybrid cross
2. To solve genetic problem: Mendel's dihybrid cross
3. To solve genetic problem: incomplete dominance
4. To solve genetic problem: co-dominance
5. To solve genetic problem: multiple alleles (ABO blood group system)
6. Principle and function of ecological tools: secchi disc, anemometer, hygrometer, lux meter, rain gauge and thermometer
7. Study of relationships among organisms (any Two example of mutualism, commensalism, parasitism)
8. Study of relationships among organisms (any two example of antibiosis, parasitism)
9. Study of relationships among organisms (any two example of predation, competition)
10. To study food chain in relation to pond ecosystem.
11. To study food web in relation to pond ecosystem.
12. To study different ecological pyramids.
13. To study freshwater planktons by preparing temporary slide.
14. To study of energy flow using models, charts
15. To study of abiotic factors temperature and light using models, charts
16. To study of biotic factors: producer, consumer and decomposers using models, charts

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
MINOR DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCZOO202

BASICS OF ZOOLOGY-II
EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Period/Week)	**Theory**	**External-25 Marks**
		Internal-25 Marks

Program Outcome:

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

Course Outcome:

After thorough understanding of the content student will be able to explain:

1. Characteristics and classification of phylum Mollusca and Annelida up to class level.
2. Economic importance of Annelida and Mollusca
3. Characteristics and classification of phylum Arthropoda and Echinodermata up to class level.
4. Economic and ecological importance of arthropods and echinoderms.

Sr. No			Credit	Hr
1	Unit-1	• General characteristics and classification of phylum Mollusca (up to class) • Type study: *Pila* (habit and habitat, external features, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system) • General characteristics and classification of phylum Annelida (up to class) • General characteristics and classification of phylum Arthropoda (up to class)	1	15

2	**Unit-2**	• Type study: Cockroach (habit and habitat, external features, body wall, endoskeleton, locomotion, digestive system, respiratory system, blood vascular system, excretory system, nervous and sensory system and reproductive system) • Useful and harmful insects • General characteristics and classification of phylum Echinodermata (up to class) • Type study: Star fish (habit and habitat, external features, water vascular system, digestive system) • General characteristics and classification of phylum Hemichordata (up to class)	**1**	**15**

Reference:

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition

2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

Further Reading:

1. Verma PS and Agrawal VK, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

2. Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE: SC23PMIDSCZOO202

BASICS OF ZOOLOGY-II
EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

List of practical

1. Study of classification of phylum Mollusca (up to class) using laboratory specimens, models, slides, charts (Chiton, Dentalium, Pila, Mitilus, Octopus).
2. Study of classification of phylum Annelida and Hemichordata (up to class) using laboratory specimens, models, slides, charts (Earthworm, Nereis, Leech, Balanoglossus).
3. Study of classification of phylum Arthropoda (up to class) using laboratory specimens, models, slides, charts (Peripatus, Limulus, Prawn, Spider, Centipede, Cockroach).
4. Study of classification of phylum Echinodermata (up to class) using laboratory specimens, models, slides, charts (Starfish, Brittle star, Sea urchin, Sea cucumber, Feather star).
5. Study of anatomy of digestive system of *Pila* using charts and models
6. Study of anatomy of nervous system of *Pila* using charts and models
7. Study of anatomy of reproductive system of *Pila* using charts and models
8. Study of anatomy of digestive system of Cockroach using charts and models
9. Study of anatomy of blood vascular system of Cockroach using charts and models
10. Study of anatomy of excretory system of Cockroach using charts and models
11. Study of anatomy of nervous system of Cockroach using charts and models
12. Study of anatomy of reproductive system of Cockroach using charts and models
13. Study of anatomy of digestive system of star fish using charts and models
14. Study of anatomy of water vascular system of star fish using charts and models
15. Prepare a temporary mounting of mouth parts of housefly, honey bee and mosquito.
16. Study of respiratory spiracles of cockroach and radula of Pila.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
MULTI DISCIPLINARY SPECIFIC COURSE CODE: SC23MDCZOO203

INTRODUCTION TO ZOOLOGY-II

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Period/Week)		**Theory**	**External-25 Marks**
			Internal- 25 Marks

Program Outcome:

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

Course Outcome:

1. The student shall have basic knowledge about general topics of genetics.
2. The student shall have basic knowledge about general topics of ecology.

Sr. No			**Credit**	**Hr**
1	**Unit-1**	• Introduction to gene concept (general structure of gene) • Introduction to Mendelian laws of Heredity: Mendel's monohybrid and dihybrid cross. • Incomplete dominance (e.g. *Mirabilis jalapa*) & Co-dominance (e.g. Roan cattle). • Multiple alleles e.g. ABO blood group system in humans & Rh factor- Erythroblastosis fetalis	**1**	**15**
2	**Unit-2**	• Definition and scope of Ecology • Importance and biological effect of abiotic factors (temperature and light) and biotic factors: producer, consumer, decomposers. Functions of ecosystem: food chain, food web, trophic levels, energy flow, ecological pyramids • Animal relationships: mutualism, commensalism, antagonism (antibiosis, parasitism, predation and	**1**	**15**

		competition) • Principle and function of ecological tools: secchi disc, anemometer, hygrometer, lux meter, rain gauge and thermometer • Pond ecosystem		

Reference:

1. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition

2. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S. Chand publishing. New Delhi.

Further Reading:

1. Verma PS and Agrawal VK, 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand publications. New Delhi.

2. Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
PRACTICAL MULTI DISCIPLINARY SPECIFIC COURSE CODE: SC23PMDCZOO203

INTRODUCTION TO ZOOLOGY-II

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

List of Practicals

1. To solve genetic problem: Mendel's monohybrid cross
2. To solve genetic problem: Mendel's dihybrid cross
3. To solve genetic problem: incomplete dominance
4. To solve genetic problem: co-dominance
5. To solve genetic problem: multiple alleles (ABO blood group system)
6. Principle and function of ecological tools: secchi disc, anemometer, hygrometer, lux meter, rain gauge and thermometer
7. Study of relationships among organisms (any two example of mutualism, commensalism, parasitism)
8. Study of relationships among organisms (any two example of predation, antibiosis, competition)
9. To study food chain and food web in relation to pond ecosystem.
10. To study different ecological pyramids.
11. To study freshwater planktons by preparing temporary slide.
12. To study of energy flow using models, charts.
13. To study of abiotic factors temperature and light using models, charts.
14. To study of biotic factors: producer, consumer and decomposers using models, charts.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
SKILL ENHANCEMENT COURSE CODE:
SC23SECZOO206

PRACTICES OF LIVESTOCK BASED FARMING

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Period/Week)	**Theory**	**External-50 Marks**

Program Outcome:

1. The programme shall help students to understand importance and role of animals in an ecosystem
2. Understand the applications of techniques to various fields of biology.
3. The programme shall provide subject based skills of various fields that provide a base for future career in disciplines such as Health Sciences, Aquaculture, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.

Course Outcome:

1. The student shall have basic knowledge importance of cow in natural farming.
2. The student shall have basic knowledge about benefits of practicing natural farming and different aspects related to it.

Sr. No			**Credit**	**Hr**
1	**Unit-1**	• History of rearing of cow in India • Indian breeds of cow • Tools of cow based natural farming: Enriching the soil/ preparation of healthy soil • Jivamrut & Bijamrut: preparation and application, uses of Ghan Jivamrut, Bramhastra, Neemastra in brief.	**1**	**15**
2	**Unit-2**	• Technique of mulching, types of mulching and benefits of mulching • Agroforestry: introduction and application • Vermicomposting, role of pollinators in farming and conservation of pollinators, • Useful birds, Insect and microorganism in farming	**1**	**15**

Reference:

1. □ાકૃતિક કૃષિ :આચાય દેવ□ત, રાજ્યપાલ Rી, ગુજરાત રાજ્ય, □કાશક :િનયામક, સમેિત અને એસ.એન.ઓ ,

આત્મા કૃષિ, ખેડૂત કલ્યાણ અને સહકાર િવભાગ, ગુજરાત.

2. The Natural Way of Farming: Masanobu Fukuoka, Bookventure , Madras

Further Reading:

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER I
PROGRAM CODE: SCIUG104
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE

FUNDAMENTALS OF ZOOLOGY-II PRACTICAL
EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 50**

Q 1	Prepare a temporary mounting of mouth parts of housefly/honey bee/mosquito.	**10**
Q 2	Draw, label the diagram of given system of particular animal and describe location and functions of different organs in brief. **OR** Identify and describe the relationship of organisms/principle and function of given ecological tool	**08**
Q 3	Solve given genetic problem as per slip.	**07**
Q 4	**Do as directed** 1. Identify and classify the specimen up to class and describe its morphological characters (Mollusca) 2. Identify and classify the specimen up to class and describe its morphological characters (Annelida) 3. Identify and classify the specimen up to class and describe its morphological characters (Arthropoda) 4. Identify and classify the specimen up to class and describe its morphological characters (Echinodermata / Hemichordata) 5. Identify and describe the function of ecological tool/ ecological model	**15**
Q5	Viva voce	**05**
Q 7	Journal submission	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

BASICS OF ZOOLOGY-II PRACTICAL

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 25**

Q 1	Draw, describe and mount mouth part of housefly/honey bee/mosquito	**04**
Q 2	Draw, label the diagram of given system of particular animal and describe location and functions of different organs in brief. **OR** Identify and describe the usefulness/harmfulness of the given insect.	**03**
Q 3	Do as directed 1. Identify and classify the specimen up to class and describe its morphological Characters. (Mollusca) 2. Identify and classify the specimen up to class and describe its morphological Characters. (Annelida) 3. Identify and classify the specimen up to class and describe its morphological Characters. (Arthropoda) 4. Identify and classify the specimen up to class and describe its morphological Characters. (Echinodermata/Hemichordata)	**12**
Q 4	Viva-voce	**03**
Q 5	Journal	**03**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER II
PROGRAM CODE: SCIUG104
PRACTICAL MULTI DISCIPLINARY SPECIFIC COURSE

INTRODUCTION TO ZOOLOGY-II PRACTICAL

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 25**

Q 1	Solve the given genetic problem of Mendel's monohybrid cross/ Mendel's dihybrid cross/ incomplete dominance/ Co-dominance/ multiple alleles (ABO blood grouping)	**05**
Q 2	Identify and describe the relationship of organisms/principle and function of given ecological tool	**05**
Q 3	**Do as directed** 1. Identify and explain the given ecological model. 2. Identify and explain the given food chain/food web of pond ecosystem. 3. Identify and describe the function of ecological tool	**09**
Q 5	Viva voce	**03**
Q 6	Journal submission	**03**

Semester II

B. Sc. Semester II (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDSC MIC201	Cell Biology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC MIC202	Cell and Biomolecules	2	25	25	50	2	2
Multi Disciplinary Course	SC23MDC MIC203	Biomolecules	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC MIC201	Cell Biology Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
		Cell biology PracticalPart B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC MIC202	Cell and Biomolecules Practical	4	25	25	50	2	More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC MIC203	Biomolecules Practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC MIC204	English	2	25	25	50	2	2
Value added courses	SC23VAC MIC205	To be select from Basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC MIC206	Microbial quality control	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCMIC201

CELL BIOLOGY

Total Credits- 04 (04Period/Week)		**Theory**	**External-50 Marks**
			Internal- 50 Marks

Objective

To understand student with concept of cell and its components and their functions

Unit-1 Structure of Cell

- Difference between plant cell and animal cell
- Plasma membrane: Structure and function
- Cell Wall: Structure of Eukaryotic cell wall and prokaryotic cell wall, Function of cell wall
- Cytoskeleton: Structure and organization of actin filaments, association of actin filaments with plasma membrane, cell surface protrusions, intermediate filaments, microtubules

Unit-II Cell organelles

- Structure and function of Mitochondria, Golgi complex, chloroplasts and peroxisomes
- Cellular function of Ribosomes, vacuoles, Lysosomes, nucleus and nuclear membrane
- Types and functions of Endoplasmic reticulum
- Cell-Cell Interactions - adhesion junctions, tight junctions, gap junctions, and plasmodesmata (only structural aspects)

Unit-III Cell cycle and regulation

- Cell division: Process of Mitosis and meiosis
- Eukaryotic cell cycle and its regulations with check points
- Cell signaling concept, signaling through G-protein coupled receptors
- Programmed cell death

Unit-IV Biology of cancer

- Introduction to cancer biology
- Cancer and cell cycle
- Development of cancer: cause, Types and cure

Reference

1. Microbiology- Michael J Pleczar – 5th Edition
2. Hardin J, Bertoni G and Kleinsmith LJ. (2010). Becker's World of the Cell. 8th edition. Pearson.

Outputs

- ✓ Student will understand basic structure of cell
- ✓ Student will know about different cell organelles and their functions
- ✓ students will understand process of cell cycle and will have hands on experience to know about mitosis and meiosis stages
- ✓ student will have basic knowledge of cancer and its relation with cell cycle also student will understand basic knowledge of development of cancer and its cure

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

PRACTICLS: SC23 PMJDSCMIC201 PART-A & PART B
CELL BIOLOGY

Total Credits-04	**Part A: 2 credit**	**(04 Period/Week)**	**Internal- 25 Marks**	**External-25 Marks**	**Total marks: 100**
	Part B: 2 credit	**(04 Period/Week)**	**Internal- 25 Marks**	**External-25 Marks**	

List of Practicals

1. Study a representative plant and animal cell by microscopy.
2. Study of the structure of cell organelles through electron micrographs
3. Cytochemical staining of DNA – Feulgen
4. Demonstration of the presence of mitochondria in striated muscle cells/ cheek epithelial cell using vital stain Janus Green B
5. Study of polyploidy in Onion root tip by colchicine treatment.
6. Identification and study of cancer cells by photomicrographs.
7. Study of different stages of Mitosis.
8. Study of different stages of Meiosis.
9. Isolation of Mitochondria
10. Cell wall staining in plant cells
11. Buccal smear – Identification of Barr Body

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

MINOR DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCMIC202

CELL AND BIOMOLECULES

Total Credits- 02 (02 Period/Week)		**Theory**	**External-25 Marks**
			Internal-25 Marks

Objective

To understand basic concept of cell and their biomolecules

UNIT-I Cell organelles

- Structure and function of Mitochondria, Golgi complex,
- Structure and function of chloroplasts and peroxisomes
- Cellular function of Ribosomes, vacuoles, Lysosomes, nucleus and nuclear membrane
- Types and functions of Endoplasmic reticulum

UNIT-II Biochemicals of cell

- Function of Carbohydrates, Classification of carbohydrates
- Classification of Amino acids, Functions of proteins, Structure of proteins
- Classification of functions of Lipids, Importance of cholesterol
- Structure of nucleotides – Purines and pyrimidines
- Functions of Vitamins and minerals

Reference

1. Biochemistry by U. Sathyanarayana and chakrapani 4th Edition (2013)
2. Hardin J, Bertoni G and Kleinsmith LJ. (2010). Becker's World of the Cell. 8th edition. Pearson.

Outcomes

- ✓ Students will understand basic cell organelles and their structure
- ✓ Student will well verse with biomolecules and their importance for life

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE:SC23PMIDSCMIC202

CELL AND BIOMOLECULES

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

LIST OF PRACTICALS

- Study a representative plant and animal cell by microscopy.
- Study of the structure of cell organelles through electron micrographs
- Qualitative tests for carbohydrates, reducing sugars, non reducing sugars
- Qualitative tests for lipids and proteins
- Study of protein secondary and tertiary structures with the help of models
- Demonstration of DNA models with help of monograph or digital image
- Estimation of protein by Folin-lawry method
- Protein estimation by Bradford method
- Estimation of carbohydrate by DNS and anthron method

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

MULTIDISCIPLINARY SPECIFIC COURSE CODE: SC23MDCMIC203

BIOMOLECULES

Total Credits- 02	**(02 Period/Week)**	**Theory**	**External-25 Marks**
			Internal- 25 Marks

Objective

To understand student about basic importance of biomolecules

UNIT-I Carbohydrate and Protein

- General functions and classification of carbohydrates
- Stereo isomerism of monosaccharides, D and L forms, epimers, Mutarotation and anomers of glucose, Storage polysaccharides - starch and glycogen (structure and function)
- Function of proteins and basic classification of Amino acids based on function, structure and properties.
- Structure of proteins: Primary, secondary, Tertiary and quaternary structures of proteins.

UNIT-II Lipids and Nucleic acid

- General functions of Lipids, Classification of Lipids
- Fatty acids: Occurrence, Even and odd carbon FA, Saturated and unsaturated FA, Nomenclature of FA
- Properties of Triacylglycerols, Phospholipids: Glycerophospholipids and sphingophospholipids, Functions of Phospholipids, General introduction of Glycolipids, Steroids: Structure and occurrence of Cholesterol
- Nucleotides: Structure of nucleotides – Purine and pyrimidines, Structure of DNA, Structure and types of RNA – mRNA, tRNA and rRNA.

Reference:

1. Biochemistry by U. Sathyanarayana and chakrapani 4th Edition (2013)
2. Fundamentals of Biochemistry by Jain & Jain, S. Chand Publications (2009)

Output

- ✓ Student will understand about biomolecules and its importance for life

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

PRACTICAL MULTIDISCIPLINARY SPECIFIC COURSE CODE:SC23PMDCMIC203

BIOMOLECULES

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

LIST OF PRACTICALS

- Qualitative tests for carbohydrates, reducing sugars, non reducing sugars
- Qualitative tests for lipids and proteins
- Study of protein secondary and tertiary structures with the help of models
- Demonstration of DNA models with help of monograph or digital image
- Demonstration of types of RNA with help of monograph or digital image

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II

PROGRAM CODE: SCIUG105

SKILL ENHANCEMENT COURSE CODE: SC23SECMIC206

MICROBIAL QUALITY CONTROL

Total Credits- 02 (02 Period/Week)	**Theory**	**External- 25 Marks** **Internal- 25 Marks**

Objective

To develop microbiology laboratory oriented skills

Unit 1 Microbiological Laboratory and Safe Practices

- Good laboratory practices - Good laboratory practices, Good microbiological practices
- Biosafety cabinets – Working of Biosafety cabinets, using protective clothing, specification for BSL1, BSL-2, BSL-3.
- Discarding biohazardous waste – Methodology of Disinfection, Autoclaving & Incineration

Unit 2 Determining Microbes in Food / Pharmaceutical Samples

- Culture and microscopic methods - Standard plate count, Most probable numbers, Direct microscopic counts, Biochemical and immunological methods: Limulus lysate test for endotoxin, gel diffusion,
- Sterility testing for pharmaceutical products Molecular methods - Nucleic acid probes, PCR based detection, biosensors.
- Detection of specific microorganisms - on XLD agar, Salmonella Shigella Agar, Manitol salt agar, EMB agar, McConkey Agar, Saboraud Agar
- Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centers

Outputs

- ✓ Student will know about GLP, Biosafety and biohazardous wastes
- ✓ Student will learn skill related to microbes determination in food and pharmaceutical samples

Reference

1. Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd ed. Academic Press

2. Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer
4. Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II
PROGRAM CODE: SCIUG104

PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE
CELL BIOLOGY PRACTICAL

PRACTICAL SKELETON (External Examination)

Time: more than 3 Hours **Total Marks: 50**

Q 1	Perform any one practical from list given below	**10**
Q 2	Perform any one practical from list given below	**10**
Q 3	Perform any one practical from list given below	**10**
Q 4	Spotting	**10**
Q 5	Viva voce	**05**
Q 6	Journal submission	**05**

PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE
CELL BIOLOGY PRACTICAL

PRACTICAL SKELETON (Internal Examination)

Time: 3 Hours **Total Marks: 50**

Q 1	Perform any one practical from list given below	**20**
Q 2	Perform any one practical from list given below	**10**
Q 3	Spotting	**10**
Q 4	Viva voce	**05**
Q 5	Lab. Records	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II
PROGRAM CODE: SCIUG105

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

CELL AND BIOMOLECULES PRACTICAL

PRACTICAL SKELETON (External Examination)

Time: 3 Hours **Total Marks: 25**

Q 1	Perform any one practical from list given below	**05**
Q 2	Perform any one practical from list given below	**05**
Q 3	Spotting	**05**
Q 4	Viva-voce	**05**
Q 5	Journal	**05**

PRACTICAL MINOR DISCPLINE SPECIFIC COURSE

CELL AND BIOMOLECULES PRACTICAL

PRACTICAL SKELETON (Internal Examination)

Time: 3 Hours **Total Marks: 25**

Q 1	Perform any one practical from list given below	**05**
Q 2	Perform any one practical from list given below	**05**
Q 3	Spotting	**05**
Q 4	Viva-voce	**05**
Q 5	Lab. Records	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER II
PROGRAM CODE: SCIUG105
PRACTICAL MULTI DISCIPLINARY SPECIFIC COURSE

BIOMOLECULES PRACTICAL

PRACTICAL SKELETON (External Examination)

Time: 3 Hours **Total Marks: 25**

Q 1	Perform any one practical from list given below	**05**
Q 2	Perform any one practical from list given below	**05**
Q 3	Spotting	**05**
Q 4	Viva-voce	**05**
Q 5	Journal	**05**

PRACTICAL MULTI DISCIPLINARY SPECIFIC COURSE
BIOMOLECULES PRACTICAL

PRACTICAL SKELETON (Internal Examination)

Time: 3 Hours **Total Marks: 25**

Q 1	Perform any one practical from list given below	**05**
Q 2	Perform any one practical from list given below	**05**
Q 3	Spotting	**05**
Q 4	Viva-voce	**05**
Q 5	Lab. Records	**05**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN

B.Sc. Biotechnology Syllabus (New Education Policy-NEP)

Document code	**Syllabus Biotechnology NEP-2023**
Name of faculty	**Science**
Faculty code	**SCI**
Programme name	**Undergraduate (B.Sc.)**
Subject	**Biotechnology**
Programme code	**SCIUG106**
Effective from	**June-2023**

Hemchandracharya North Gujarat University,
PATAN

B.Sc. Biotechnology Syllabus

w.e.f.

from June 23-24 under NEP

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER II

Cell Biology **SC23MJDSCBIO201**

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 04 (04 Periods/ Week)	**Theory**	External **50 marks**
		Internal **50 marks**

Program Outcome

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

Course Outcome

1. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially membranes, and organelles
2. Students will understand how these cellular components are used to generate and utilize energy in cells
3. Students will understand the cellular components underlying mitotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.

Sr. No.			Credit	Hrs.
1	UNIT-1	What is cell? discovery and historical development of cell biology Types of cell, prokaryotic and eukaryotic cell Prokaryotic cell structure Overview of eukaryotic cell structure Vacuoles in plants	1	15
2	UNIT-2	Cell membrane, Fluid mosaic model of cell membrane Function of cell membrane: types of transport process across cell membrane Cell wall : chemical composition and function Cytoskeleton	1	15
3	UNIT-3	Endoplasmic reticulum: types, structure and function Golgi apparatus: structure and function Lysosome : origin , structure and function Ribosome : structure and function, Centrioles		
4	UNIT-4	Mitochondria, Chloroplast: Grana and stroma Nucleus : Nuclear membrane , Nucleolus and Chromatin material, Introduction to chromosome structure		

References:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

Further Reading:

1. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
2. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

SC23PMJDSCBIO201 Cell Biology Practicals

Group A

1. Microscopy- Simple & Compound- Basic components & Principle
2. Stains, their types and principal
3. Dyes and their principal
4. Block preparation for plant samples
5. Block preparation for animal tissue samples
6. Microtomy and its types
7. Fixation techniques for plant, animal tissue and bacteria
8. Mounting the sample on slide: various chemicals used as mount
9. Simple staining
10. Negative staining

Group B

11. Gram staining
12. Capsule staining
13. Nuclear Mitochondrial staining
14. Study structure of Prokaryotic cell
15. Study structure of Eukaryotic cell.
16. Cell division in onion root tip
17. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.
18. Study, observation and identification of various permanent slides
19. Preparation of Nuclear, Mitochondrial & cytoplasmic fractions.
20. SEM/ TEM

Note: In case a hand on experiment is not possible, models can be used.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER II

Cell Biology **SC23MIDSCBIO202**

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **25 marks**
		Internal **25 marks**

Program Outcome

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

Course Outcome

1. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially membranes, and organelles
2. Students will understand how these cellular components are used to generate and utilize energy in cells
3. Students will understand the cellular components underlying mitotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.

Sr. No.			Credit	Hrs.
1	UNIT-1	Cell Theory Prokaryotic cell structure Eukaryotic cell structure Vacuoles in plants Cell membrane as semi and selectively permeable membrane Fluid mosaic model of cell membrane Function of cell membrane Cell wall Cytoskeleton	1	15
2	UNIT-2	Endoplasmic reticulum: rough endoplasmic reticulum and smooth endoplasmic reticulum Golgi apparatus: structure and function Lysosome : origin , structure and function Ribosome : structure and function Centrioles Mitochondria & Chloroplast Nucleus Chromosome structure Nucleolus	1	15

References:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

Further Reading:

1. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
2. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

SC23PMIDSCBIO202 Cell Biology Practicals

1. Microscopy- Simple & Compound- Basic components & Principle
2. Stains, their types and principal
3. Dyes and their principal
4. Block preparation for plant samples
5. Block preparation for animal tissue samples
6. Microtomy and its types
7. Fixation techniques for plant, animal tissue and bacteria
8. Mounting the sample on slide: various chemicals used as mount
9. Simple staining
10. Negative staining
11. Gram staining
12. Capsule staining
13. Nuclear Mitochondrial staining
14. Study structure of Prokaryotic cell
15. Study structure of Eukaryotic cell.
16. Cell division in onion root tip
17. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.
18. Study, observation and identification of various permanent slides
19. Preparation of Nuclear, Mitochondrial & cytoplasmic fractions.
20. SEM/ TEM

Note: In case a hand on experiment is not possible, models can be used.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER II

Cell Biology **SC23MDCBIO203**

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **25 marks**
		Internal **25 marks**

Program Outcome

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

Course Outcome

1. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially membranes, and organelles
2. Students will understand how these cellular components are used to generate and utilize energy in cells
3. Students will understand the cellular components underlying mitotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.

Sr. No.			Credit	Hrs.
1	UNIT-1	Cell Theory Prokaryotic cell structure Eukaryotic cell structure Vacuoles in plants Cell membrane as semi and selectively permeable membrane Fluid mosaic model of cell membrane Function of cell membrane Cell wall Cytoskeleton	1	15
2	UNIT-2	Endoplasmic reticulum: rough endoplasmic reticulum and smooth endoplasmic reticulum Golgi apparatus: structure and function Lysosome : origin , structure and function Ribosome : structure and function Centrioles Mitochondria & Chloroplast Nucleus Chromosome structure Nucleolus	1	15

References:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

Further Reading:

1. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
2. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

SC23PMDCBIO203 Cell Biology Practicals

1. Microscopy- Simple & Compound- Basic components & Principle
2. Stains, their types and principal
3. Dyes and their principal
4. Block preparation for plant samples
5. Block preparation for animal tissue samples
6. Microtomy and its types
7. Fixation techniques for plant, animal tissue and bacteria
8. Mounting the sample on slide: various chemicals used as mount
9. Simple staining
10. Negative staining
11. Gram staining
12. Capsule staining
13. Nuclear Mitochondrial staining
14. Study structure of Prokaryotic cell
15. Study structure of Eukaryotic cell.
16. Cell division in onion root tip
17. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.
18. Study, observation and identification of various permanent slides
19. Preparation of Nuclear, Mitochondrial & cytoplasmic fractions.
20. SEM/ TEM

Note: In case a hand on experiment is not possible, models can be used.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER II

Agriculture Biotechnology **SC23SECBIO206**

EFFECTIVE FROM JUNE 2023-24 UNDER NEP

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **50 marks**

Program Outcome

1. Students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.
2. Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.
3. Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.
4. Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?
5. Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.
6. Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.
7. Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.
8. Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

Course Outcome

1. Demonstrate the ability to communicate effectively both orally and in writing.
2. Demonstrate knowledge of the legal and ethical environment impacting business organizations and exhibit an understanding and appreciation of the ethical implications of decisions.
3. Demonstrate an understanding of and appreciation for the importance of the impact of globalization and diversity in modern organizations.
4. Demonstrate an ability to engage in critical thinking by analyzing situations and constructing and selecting viable solutions to solve problems.
5. Demonstrate an ability to work effectively with others.
6. Demonstrate knowledge of current information, theories and models, and techniques and practices in all of the major business disciplines.

Sr. No.			Credit	Hrs.
1	UNIT-1	Introduction, Cryo and organogenic differentiation, Types of culture: Seed , Embryo, Callus, Organs, Cell and Protoplast culture. Micropopagation Axillary bud proliferation, Meristem and shoot tip culture, cud culture, organogenesis, embryogenesis, advantages and disadvantages of micropropagation.	1	15
2	UNIT-2	Protoplast Isolation and fusion Methods of protoplast isolation, Protoplast development, Somatic hybridization, identifiation and selection of hybrid cells, Cybrids, Potential of somatic hybridization limitations. Somaclonal variation Nomenclautre, methods, applications basis and disadvantages. Plant Growth Promoting bacteria. Nitrogen fixation, Nitrogenase, Hydrogenase, Nodulation, Biocontrol of pathogens, Growth promotion by free-living bacteria.	1	15

References:

1. Bhojwani, S.S. and Razdan 2004 Plant Tissue Culture and Practice.

Further Reading:

1. Slater, A., Scott, N.W. & Fowler, M.R. 2008 Plant Biotechnology: The Genetic Manipulation of Plants, Oxford University Press

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. (Mathematics)

Detailed Syllabus as per NEP with Effect from July 2023

FACULTY:	**SCIENCE**
SUBJECT:	**MATHEMATICS**
PROGRAMME NAME:	**BACHELOR OF SCIENCE**
PROGRAMME CODE:	**SCIUG107**
SEMESTER:	**I to II (1st Year)**
TOTAL PAGE:	**01 TO 39 (with First Cover Page)**
DATE:	**10 August 2023**

Term	Type of Course	Mathematics Course Code	Total Units /Practical	Credit	Hrs. Per Term	External Marks (SEE)	Internal Marks (CCE)	Total Marks	External Examination Duration	Page No
Semester I	MJDSC	Paper-1	4	4	60	50	50	100	2.5Hrs	02/39
		Practical	Group A:10 Group B:10	4	120	50	50	100	Min5.0Hrs	04/39 & 06/39
	MIDSC	Paper-1	2	2	30	25	25	50	2Hrs	10/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	12/39
	MDC	Paper-1	2	2	30	25	25	50	2Hrs	14/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	16/39
	SEC	Paper-1	2	2	30	25	25	50	2.0Hrs	18/39
Semester II	MJDSC	Paper-1	4	4	60	50	50	100	2.5Hrs	20/39
		Practical	Group A:10 Group B:10	4	120	50	50	100	Min5.0Hrs	22/39 & 24/39
	MIDSC	Paper-1	2	2	30	25	25	50	2Hrs	27/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	29/39
	MDC	Paper-1	2	2	30	25	25	50	2Hrs	31/39
		Practical	10	2	60	25	25	50	Min2.5Hrs	3134/39
	SEC	Paper-1	2	2	30	25	25	50	2.0Hrs	35/39
Sem 1 & Sem 2			Evaluation System for CCE and SEE							37/39

B.Sc. (Mathematics) Semester-II

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Major Discipline Theory Course-2**
COURSE CODE:	**SC23MJDSCMAT201**
PAPER NAME	**Advance Mathematics**
Total Theory Credit:	**04**
Exam Pattern:	**50 Marks (CCE) + 50 Marks (SEE) = 100 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
1.	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2.	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3.	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4.	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**
Course Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**
3.	**Understand the concepts of applications of integration.**
4.	**Develop the skill of solving linear and homogeneous differential equations by using various methods.**

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
	1	**Matrices: Introduction of matrices, Hermitian and Skew-Hermitian Matrices, Linear dependence and Independence of row and column Matrices, Row rank, Column rank and Rank of matrix, Row- reduced Echelon form of a Matrix and matrix inversion and their all-related examples, Solution of the system linear equations.**	1	15
	2	**Integration: (Revision: Definition of integration, repeat all formulae of integration) Derive Redaction formula for $\int \sin^n x \, dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \sin^n x \, dx$ where $n \in N$, $\int \sin^n x \, dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \cos^n x \, dx$ where $n \in N$ and $\int \sin^m x \cos^n x \, dx$, where $m, n \in N$ and using this find the formula of $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx$ where $m, n \in N$ and their related examples, Some examples of Summation of the series using integration.**	1	15
	3	**Applications of Integration: Derive the formula for arc length using definite integral and its applications, derive the formulas for surface area and volume using definite integral and its applications.**	1	15
	4	**Differential Equation: (Revision: Order and degree of differential equation, Constant and arbitrary constant in Solution of differential equation, General Solution, Method of finding differential Equation, Method of Solution of Differential Equation Separable variable, Differential Equation Homogenous differential Equation) Linear differential Equation: $\frac{dy}{dx} + Py = Q$ where P and Q are functions of x, Linear Differential equation with Constant coefficients, Bernoulli's differential Equation with applications, Clairaut equation with applications.**	1	15

References:

1.	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2.	B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646
3.	N.M. Kapoor, A Text Book of Differential Equations, 10th Edition, Pitambar Publishing Co. Ltd., New Delhi, ISBN: 978-8120902905

Further Reading:

1.	Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732
2.	Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302
3.	Wolfgang Walter, Ordinary Differential Equations,

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Major Discipline Practical Course-2** **Practical on Advance Mathematics (Group A)**
COURSE CODE:	**SC23PMJDSCMAT201 (A)**
Practical Credit:	**02 (04 hours per15 students batch in a week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
1.	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2.	**Upon completion of the program, students should be able to apply mathematical principles to analyse and solve complex problems in various fields such as engineering, computer science, and physics.**
3.	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4.	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**
Course Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**
3.	**Understand the concepts of applications of integration.**

Sr. No.	Practical Details
1.	**Hermitian and Skew-Hermitian Matrices** **Task: Explore the definition of a Hermitian and Skew-Hermitian Matrices and their properties and provide examples illustrating the concepts.**
2.	**Linear dependence and independence of row and column of matrices.** **Task: Explore the Linear dependence and independence of row and column of matrices and provide examples illustrating the concepts.**
3. & 4.	**Rank of a Matrix** **Task: Analyze the definition of row and column Rank of a Matrices and Rank of a Matrices by means of examples.**
5. & 6.	**Row Reduction Echelon Form** **Task: by means of Row Reduction Echelon Form find the rank and inverse of matrices and other related examples.**
7.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x$**
8.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\cos x$**
9.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x \cdot \cos x$**
10.	**Evaluate integration of higher power of trigonometric function using substitution method.** **Task: Examples of integration of higher power of trigonometric function using substitution method.**
Note: Minimum EIGHT practical to be performed	
References:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646**
Further Reading:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi** **ISBN: 978-0070602302**

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Major Discipline Practical Course-2 (Group-B)**
COURSE CODE:	**SC23PMJDSCMAT201 (B)**
With Effect From :	**JULY 2023**
Total Practical Credits:	**02 (04 Period /Week) (Batch of 15 Students)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

The basic requirement for the smooth and better conduction of the practical program:

1. Must require a Computer operator and a peon for better conduction of the practical and maintenance of computer systems.
2. Must have a computer lab fully equipped with Microsoft Office tools and internet facility.

Program Outcome :	
1	The B.Sc. program in Mathematics aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.
2	Upon completing the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.
3	The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.
4	Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, and algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.
Course Outcome :	
1	**Proficiency in Microsoft Word for Mathematical Writing:** • Students should be able to create and format mathematical documents using Microsoft Word, including equations, symbols, and mathematical notation. • They should understand how to use Word features to structure and organize their mathematical research papers effectively.
2	**Data Analysis with Microsoft Excel:** • Students should gain a good understanding of Excel functions and tools relevant to mathematical data analysis. • They should be able to use Excel for tasks like organizing data, generating charts, and performing basic statistical analyses.
3	**Creating Presentations with Microsoft PowerPoint:** • Students should be able to create engaging and informative presentations on mathematical topics using PowerPoint. • They should understand how to effectively use visual aids, diagrams, and graphs to communicate mathematical concepts.

No.	PRACTICALDETAILS
Unit-1	**Microsoft Office Excelcharts Used in Mathematical Research**
1	**Create Effective Charts to Present Data Visually** • Inserting Columns, Pie charts, etc. • Create an effective chart with Chart Tool • Design, Format, and Layout options • Adding chart title • Changing layouts • Chart styles • Editing chart data range • Editing data series • Changing chart **(Questions to be asked in Practical: Creating different types of charts in Excel worksheet for the given data to visualize data easily which is to be used in a research paper and formatting them)**
2	**Solving Equations** • Using the Quadratic Formula • Using SOLVER • Solving Equations Using Graphs **(Questions to be asked in Practical: Equations to be given for solving using Excel worksheet which is to be used in a research paper)**
Unit-2	**Microsoft Office Excel Tools Used in Mathematical Research**
3 &4	**Functions (Two Practical)** • Calculating Numerical Expressions • Using Function Notation • Creating Function • Graphing Function • Piecewise Functions • Finding Intersection Points • Finding Maximum and Minimum **(Questions to be asked in Practical: Finding Maximum, Minimum values, Intersection points of given equations which is to be used in a research paper)**
Unit-3	**Microsoft Office Excel Tools Used in Mathematical Research**
5 & 6	**Exponential and Logarithmic Functions (Two Practical)** • Evaluating Powers of e • Evaluating Expressions Involving Logarithms **(Questions to be asked in Practical: Finding values of exponential functions, logarithmic functions, and equations containing them which is to be used in a research paper)**
7	**Mathematics of Finance (Two Practical)** • Compound Interest • Effective Rate • Present Value for Compound Interest • Future Value of the Ordinary Annuity • Future Value of the Annuity Due
Unit-4	**Microsoft Office PowerPoint Tools Used in Mathematical Research**

8	**Hyperlinks and Action Buttons in PowerPoint (Two Practical)** • Inserting Hyperlinks and Action Buttons • Edit Hyperlinks and Action Button • Word Art and Shapes
9	**Working with Movies and Sounds** • Inserting Movie from a Computer File • Inserting an Audio file • Audio Video playback and format options • Video options, Adjust options • Reshaping and bordering Video
10	**Using SmartArt and Tables** • Working with Tables, Table Formatting • Table Styles • Alignment option • Merge and split option • Converting text to smart art **(Questions to be asked in Practical: To make a PowerPoint presentation using the word file made using the above practical and presenting it which are to be used in RDC of Ph. D.)**
References:	
1	**"Excel Spreadsheet Manual for Applied Mathematics" by Stela Pudar-Hozo, Indiana University North west, Pearson Publication**
2	**"Microsoft PowerPoint 2019 Step by Step" by Joan Lambert and Joyce Cox:**
3	**"Microsoft Word 2019 For Dummies" by Dan Gookin**
4	**"Microsoft Excel Data Analysis and Business Modeling" by Wayne L. Winston**
Further Reading:	
1	**"MathType Cookbook" by Richard L. Evans and W. J. "Jerry" Cody:**
2	**"Math into LaTeX" by George Grätzer:**
3	**Applied Mathematics with Microsoft Excel by Chester Piascik published by Brooks/Cole**
4	**Microsoft Office Book by Rouf published by Innovative Solutions**

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Minor Discipline Theory Course-2**
COURSE CODE:	**SC23MIDSCMAT202**
PAPER NAME	**Matrices and Reduction Formulas**
Theory Credit:	**02**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
1.	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2.	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3.	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4.	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**
Course Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**

UNIT	DETAILS	CREDIT	Total Hrs.
1	**Matrices: Introduction of matrices, Hermitian and Skew-Hermitian Matrices, Linear dependence and Independence of row and column Matrices, Row rank, Column rank and Rank of matrix, Row- reduced Echelon form of a Matrix and matrix inversion and their all-related examples, Solution of the system linear equations.**	1	15
2	**Integration: (Revision: Definition of integration, repeat all formulae of integration) Derive Redaction formula for $\int \sin^n x \, dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \sin^n x \, dx$ where $n \in N$, $\int \sin^n x \, dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \cos^n x \, dx$ where $n \in N$ and $\int \sin^m x \cos^n x \, dx$, where $m, n \in N$ and using this find the formula of $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx$ where $m, n \in N$ and their related examples, Summation of the series.**	1	15
References:			
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**		
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, New Delhi ISBN:978-8126558646**		
Further Reading:			
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**		
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302**		

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Minor Discipline Practical Course-2** **Practical on Matrices and Reduction Formulas**
COURSE CODE:	**SC23PMIDSCMAT202**
Practical Credit:	**02 (04 hours per15 students batch in a week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
1.	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2.	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3.	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4.	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**
Course Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**
3.	**Understand the concepts of applications of integration.**
4.	**Develop the skill of solving linear and homogeneous differential equations by using various methods.**

Sr. No.	Practical Details
1.	**Hermitian and Skew-Hermitian Matrices** **Task: Explore the definition of a Hermitian and Skew-Hermitian Matrices and their properties and provide examples illustrating the concepts.**
2.	**Linear dependence and independence of row and column of matrices.** **Task: Explore the Linear dependence and independence of row and column of matrices and provide examples illustrating the concepts.**
3. & 4.	**Rank of a Matrix** **Task: Analyze the definition of row and column Rank of a Matrices and Rank of a Matrices by means of examples.**
5. & 6.	**Row Reduction Echelon Form** **Task: by means of Row Reduction Echelon Form find the rank and inverse of matrices and other related examples.**
7.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x$**
8.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\cos x$**
9.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x \cdot \cos x$**
10.	**Evaluate integration of higher power of trigonometric function using substitution method.** **Task: Examples of integration of higher power of trigonometric function using substitution method.**
Note: Minimum EIGHT practical to be performed.	
References:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646**
Further Reading:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302**

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Multi-Discipline Theory Course-2**
COURSE CODE:	**SC23MDCMAT203**
PAPER NAME	**Mathematics – II**
Total Theory Credit:	**02**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
1.	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2.	**Upon completion of the program, students should be able to apply mathematical principles to analyse and solve complex problems in various fields such as engineering, computer science, and physics.**
3.	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4.	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**
Course Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**

UNIT	DETAILS	CREDIT	Total Hrs.
1	**Matrices: Introduction of matrices, Hermitian and Skew-Hermitian Matrices, Linear dependence and Independence of row and column Matrices, Row rank, Column rank and Rank of matrix, Row- reduced Echelon form of a Matrix and matrix inversion and their all-related examples, Solution of the system linear equations.**	1	15
2	**Integration: (Revision: Definition of integration, repeat all formulae of integration) Derive the Redaction formulas of for $\int \sin^n x\ dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \sin^n x\, dx$ where $n \in N$, $\int \sin^n x\ dx$ where $n \in N$ and using this formula find the formula of $\int_0^{\frac{\pi}{2}} \cos^n x\, dx$ where $n \in N$ and $\int \sin^m x \cos^n x\, dx$, where $m, n \in N$ and using this find the formula of $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\, dx$ where $m, n \in N$ and their related examples, Summation of the series.**	1	15
References:			
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**		
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646**		
Further Reading:			
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**		
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd., New Delhi ISBN: 978-0070602302**		

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Multi-Discipline Practical Course-2** **Practical on Mathematics – II**
COURSE CODE:	**SC23PMDCMAT203**
Practical Credit:	**02 (04 hours per15 students batch in a week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**June 2023**

Program Outcomes:	
1.	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2.	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3.	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4.	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**
Course Outcomes:	
1.	**Understand the properties of matrices, row and column dependence, rank and inverse of a matrix. By applying matrix operations solve the systems of linear equations.**
2.	**Analyze the concepts of integral calculus and its applications in various fields.**
3.	**Understand the concepts of applications of integration.**
4.	**Develop the skill of solving linear and homogeneous differential equations by using various methods.**

Sr. No.	Practical Details
1.	**Hermitian and Skew-Hermitian Matrices** **Task: Explore the definition of a Hermitian and Skew-Hermitian Matrices and their properties and provide examples illustrating the concepts.**
2.	**Linear dependence and independence of row and column of matrices.** **Task: Explore the Linear dependence and independence of row and column of matrices and provide examples illustrating the concepts.**
3. & 4.	**Rank of a Matrix** **Task: Analyze the definition of row and column Rank of a Matrices and Rank of a Matrices by means of examples.**
5. & 6.	**Row Reduction Echelon Form** **Task: by means of Row Reduction Echelon Form find the rank and inverse of matrices and other related examples.**
7.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x$**
8.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\cos x$**
9.	**Reduction Formulas for Trigonometric Functions** **Task: Examples of reduction formulas for higher power of $\sin x \cdot \cos x$**
10.	**Evaluate integration of higher power of trigonometric function using substitution method.** **Task: Examples of integration of higher power of trigonometric function using substitution method.**
Note: Minimum EIGHT practical to be performed.	
References:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**B. S. Vatssa, Theory of Matrices, 2nd Edition, Wiley Eastern Ltd, ISBN:978-8126558646**
Further Reading:	
1.	**Shanti Narayan, Integral Calculus, S. Chand Publishing, ISBN: 978-9352836732**
2.	**Matrix operation, Schaum's Series Tata McGraw-Hill Publishing Co. Ltd. , New Delhi ISBN: 978-0070602302**

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B. Sc.) SCIUG107**
SEMESTER:	**II**
COURSE NAME:	**Skill Enhancement Course-2**
COURSE CODE:	**SC23SECMAT206**
PAPER NAME	**Mathematics for Competitive Exams-2**
With Effect From :	**JULY 2023**
Total Theory Credits:	**02 (02 Period /Week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**

Program Outcome :	
1	**The B.Sc. Mathematics program aims to equip students with a strong foundation in mathematical concepts, techniques, and problem-solving skills.**
2	**Upon completion of the program, students should be able to apply mathematical principles to analyze and solve complex problems in various fields such as engineering, computer science, and physics.**
3	**The program also focuses on developing students' critical thinking and logical reasoning abilities, enabling them to effectively communicate mathematical ideas and concepts.**
4	**Graduates of the B.Sc. Mathematics program will possess a solid understanding of advanced Mathematical topics, including calculus, algebra, preparing them for further academic pursuits or careers in research, teaching, data analysis, or other math-intensive professions.**

Course Outcome :	
1	**Students get knowledge about mathematical rules, formulae and concepts for competitive examination.**
2	**Students were aware with the short tricks to solve the problems asked in competitive examination which are time consuming by its usual methods of solving them.**

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	**Simplification: VBODMAS Rule, Basic Formulae** **Approximation: Basic Rules to Solve the Problems by Approximation** **Word Problems Based on Numbers: Types of Word Problems Based on Numbers** **Average: Average, Properties of Average, Important Formulae Related to Average of Numbers, Short Cut Techniques**	1	15
2	2	**Percentage: Percentage, Formulae to Calculate Percentage, Short Cut Techniques** **Profit and Loss: Basic Formulae Related to Profit and Loss, Short Cut Techniques** **Discount: Marked Price, Basic Formulae Related to Discount, Successive Discount, Short Cut Techniques**	1	15
References:				
1	**Rajesh Verma, Fast Track objective Arithmetic, Arihant Publication India Ltd.**			
2	**Dr. R. S. Agrawal, Quantitative Aptitude, S. Chand Publication India Ltd.**			
Further Reading:				
1	**Satish Kumar, Maths in Moments, Arihant Publication India Ltd.**			
2	**Abhinay Sharma, Competitive Mathematics, Kiran Institute of Career Excellence.**			
3	જગદીશ પટેલ, લિબર્ટી સહાયક, લિબર્ટી કેરિયર એકેડેમી.			

Methods of assessing the Major Theory Course Ooutcomes for Sem 1 & Sem 2

- **Components* of CCE (Continuous and Comprehensive Evaluation): 50 marks**

Sr. No.	Component	Duration (if any)	Marks
1	Daily/Weekly/Monthly Unit Test/ Exam	$1\frac{1}{2}$hours	25
2	Assignment/ Quiz Test		10
3	Development of Soft Skills		05
4	Class activity		05
5	Attendance		05
Grand Total			50
Development of Soft Skills		• Seminar • Group Discussion	
Class activity		• Problem Solving • Work base tanning • Reading Analyzing	

- **SEE (Semester End Evaluation): 50 marks**

Que. No.	Unit No.	Question	Marks
1	Unit 1	Long Questions (Attempt any two out of three)	10
2	Unit 2	Long Questions (Attempt any two out of three)	10
3	Unit 3	Long Questions (Attempt any two out of three)	10
4	Unit 4	Long Questions (Attempt any two out of three)	10
5	Unit 1 to 4	Short Questions (Attempt any five out of seven)	10

Methods of assessing the Minor/Multidiscipline/Skill Enhancement Theory Course Outcomes for Sem 1 and Sem 2

- **Components* of CCE (Continuous and Comprehensive Evaluation): 25 marks**

Sr. No.	Component	Duration (if any)	Marks
1	Daily/Weekly/Monthly Unit Test/ Exam	$1\frac{1}{2}$hours	15
2	Assignment/ Quiz Test, Development of Soft Skills and Class activity		05
3	Attendance		05
Grand Total			25
Development of Soft Skills		• Seminar • Group Discussion	
Class activity		• Problem Solving • Work base tanning • Reading Analysing	

- **SEE (Semester End Evaluation): 25 marks**

Que. No.	Unit No.	Question	Marks
1	Unit 1	Long Questions (Attempt any two out of three)	10
2	Unit 2	Long Questions (Attempt any two out of three)	10
3	Unit 1 & 2	Short Questions (Attempt any five out of seven)	05

Practical Paper Structure for Internal Examination: SEM:1 & 2
Major (GROUP-A)/ Major(GROUP-B)/Minor/Multidiscipline
Continuous and Comprehensive Evaluation
Total Marks: 25 Time for Practical: 2.5 Hrs.
Instructions: Strictly follow the instructions given by the examiner(s)
1. Attempt any One out of two (5 Marks)
2. Attempt any One out of two (5 Marks)
3. Attempt any One out of two (5 Marks)
4. Attempt any One out of two (5 Marks)
5.Journal/Viva (5 Marks)
Semester End Evaluation (SEM.-1 & 2)
Total Marks: 25 Time for Practical: 2.5 Hrs.
Instructions: Strictly follow the instructions given by the examiner(s)
1. Attempt any One out of two (5 Marks)
2. Attempt any One out of two (5 Marks)
3. Attempt any One out of two (5 Marks)
4. Attempt any One out of two (5 Marks)
5.Journal/Viva (5 Marks)