હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC B (2.21) State University

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

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેકસ : (૦૨૭૬૬) ૨૩૧૯૧૭

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પરિપત્ર નં.- ૮૭ /૨૦૨૪ *રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦*

વિષયઃ વિજ્ઞાન વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના સેમેસ્ટર-૦૩ અને ૦૪ના શૈ.વર્ષઃ ૨૦૨૪-૨૫થી ક્રમશઃ અમલમાં આવતા અભ્યાસક્રમ / પરિક્ષા સ્કીમ અંગે.

આ યુનિવર્સિટીની વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, વિજ્ઞાન વિદ્યાશાખાની તારીખઃ 30/03/૨૦૨૪ના રોજ મળેલ સભાના નિર્દિષ્ટ ઠરાવોથી રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦ અંતર્ગત UGCની Guideline મુજબ વિજ્ઞાન વિદ્યાશાખા હેઠળના નીચેના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો મંજુર કરવા કરેલ ભલામણ માન. કુલપતિશ્રીએ એકેડેમિક કાઉન્સિલવતી સ્વીકારી શૈક્ષણિક વર્ષઃ ૨૦૨૪-૨૫થી ક્રમશઃ અમલમાં આવે તે રીતે મંજુર કરેલ છે, જેનો અમલ કરવા સારૂ સબંધિતોને આ સાથે મોકલવામાં આવે છે.

ક્રમ	અભ્યાસક્રમ	ઠરાવ ક્રમાંક	સેમેસ્ટર
૧	ભૌતિકશાસ્ત્ર	૩	સેમેસ્ટર ૩ અને ૪
૨	રસાયણશાસ્ત્ર	૪	સેમેસ્ટર ૩ અને ૪
૩	વનસ્પતિશાસ્ત્ર	૫	સેમેસ્ટર ૩ અને ૪
૪	ઝુલોજી	૬	સેમેસ્ટર ૩ અને ૪
૫	માઇક્રોબાયોલોજી	૭	સેમેસ્ટર ૩ અને ૪
૬	બાયોટેકનોલોજી	૮	સેમેસ્ટર ૩ અને ૪
૭	ગણિતશાસ્ત્ર	૯	સેમેસ્ટર ૩ અને ૪

સદર બાબતની જાણ આપના સ્તરે થી અધ્યાપકશ્રીઓ તથા વિદ્યાર્થીઓને કરવા વિનંતી છે.

નોંધઃ (૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરીપત્રની એક નકલ કોલેજના / ડિપાર્ટમેન્ટના ગ્રંથાલયમાં મૂકવાની રહેશે.

(૨) આ પરીપત્ર યુનિવર્સિટીની વેબસાઇટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરવામાં આવેલ છે. આથી સંબિધત કોલેજોને ડાઉનલોડ કરી ઉપયોગ કરવા સારૂ જણાવવામાં આવે છે.

બિડાણઃઉપર મુજબ

કા. કુલસચિવ

નં-એકે/અ×સ/૪૮/૨૦૨૪

તારીખ:૧૬/૫/૨૦૨૪

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.(વિદ્યાર્થીઓના ઉપયોગ સારૂ રેકર્ડ ફાઇલ અર્થે)

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)

Hemchandracharya North Gujarat University
PATAN-384 265

FacultyofScience
U.G.(B.Sc.Honours)PHYSICSProgramme
(WithResearch/withoutResearch)
CBCS :: Semester :: Grading Pattern

CurriculumandCreditFrameworkForSEM IIIandIV
AsperUGCGuideline
(AccordingtoNATIONALEDUCATIONPOLICY(NEP)–2020)

NewSyllabus PHYSICS

WitheffectfromJune2024

B.Sc.SemestersIVExitOption

Submittedon21th MARCH 2024

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–IV

TYPEOFCOURSE:MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23MJDSCPHY401

COURSENAME:CLASSICAL MECHANICS, NUCLEAR PHYSICS AND PLASMA PHYSICS

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:04 TeachingHoursperWeek:04TeachingHoursperSemester: 60	THEORY MAJOR I	ExternalMarks-50 InternalMarks-50

CourseObjective:

- To understand the principles of classical mechanics
- To get knowledge of nuclear physics, detectors and accelerators.
- To get comprehensive knowledge of radioactivity.
- To understand the Plasma and its behaviour.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Get complete understanding of classical mechanics through equation of motion, motion under force, mechanics of system of particles, energy of the system etc.
- Understand the nuclear physics through the Q equation, types of nuclear reaction, detectors, accelerators, Cyclotron and Synchrotron.
- Understand the details of radioactivity and its properties, radioactive growth and decay, determination of the age of the Earth, Carbon dating etc.
- The knowledge of basic concepts of Plasma, composition and characteristics of Plasma, collisions, diffusion and mobility, viscosity, conductivity etc. will be accomplished.

Syllabus

UnitNo.	Content	Credit	Lect.Hrs60
Unit-1	**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)* **Basic Reference**: *Introduction to Classical Mechanics by R G Takwale & P S Puranik McGrawHill Education (India) Private Limited*	1	15
Unit 2	**NUCLEAR PHYSICS :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) **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. (*Related Examples, Problems, MCQ & SQs.)*	1	15

	Basic reference: *Nuclear Physics by S. B. Patel (New age International (p) Ltd. Publishers)*		
Unit -3	**Radioactivity:** Introduction (2.1), Properties ofRadioactive rays (2.2), The law of Radioactive Decay (2.3) Statistical Nature ofRadioactivity (2.4), The Statistical Errors of Nuclear Physics(2.5), 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) (*Related Examples, Problems, MCQ & Short Questions)* **Basic reference**: *Nuclear Physics by S. B. Patel (New age International (p) Ltd. Publishers)*	1	15
Unit-4	**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)* **Basic Reference:** *Elements of Plasma physics by S.N. Goswami New Central book Agency (p) Ltd., Calcutta.*	1	15

: Further Reading – Other References:

1. Concept of Modern Physics by Besier McGraw-Publishers
2. Classical Mechanics by Goldstein Narosa Publishing House New Delhi
3. Classical Mechanics by Yashavant Waghmare
4. Classical Mechanics by N C Rana and P S Joag
5. Elements of Nuclear Physics by M.L.Pandya & R.P.S. Yadav Kedarnath Rmnath Meerut
6. Nuclear Physics by Kaplan 3. Nuclear Physics by D C tayal, Himalaya Publishing House
7. Nuclear Physics by S N Ghoshal S. Chand
8. Elements of Nuclear physics by M.L.Pandya & R.P.S. Yadav Kedarnath Rmnath Meerut
9. Nuclear Physics by Kaplan 3. Nuclear Physics by D C tayal, Himalaya Publishing House
10. Introduction to Plasma Physics and Controlled Fusion Vol-1 F.F.Chen.
11. Plasma physics by S.N.Sen

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–IV

TYPEOFCOURSE:MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23MJDSCPHY401A

COURSENAME:MATHEMATICAL PHYSICS, QUANTUM MECHANICS, ELECTRONICS

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:04 TeachingHoursperWeek:04TeachingHoursperSemester: 60	THEORY MAJOR II	ExternalMarks-50 InternalMarks-50

CourseObjective:

- To get knowledge of mathematical Physics by using Fourier Series and Curvilinear coordinates.
- To get knowledge of Quantum mechanics.
- To get basic knowledge of transistor amplifiers, JFET, UJT and SCR.
- To attain knowledge of digital electronics through BCD, universal gates, arithmetic circuits etc.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Get understanding of mathematical Physics through Fourier series, application of Fourier series, even and odd functions. As well as Curvilinear Coordinates, Scale factor for orthogonal systems.
- Student will attain the knowledge of quantum mechanics through the study of normalization and probability and particle in a square well potential, Schrodinger equation and stationer states.
- Students will get basic knowledge of transistor amplifiers, h-parameters with equivalent circuit, Mathematical analysis and solid state Devices.
- Through the digital electronics students will study number system using Decimal, Binary, Hexadecimal and Octal, Binary, BCD, Gray, Excess-3 Codes, Universal Gate, Arithmetic Circuits – Exclusive – OR Gate, Application of X-OR Gate etc.

Syllabus

Unit No.	Content	Credit	Lect.Hrs60
Unit-1	**MATHEMATICAL PHYSICS** **Fourier 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) **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, MCQ & SQs)* **Basic Reference**: 1. *Mathematical method for physical sciences by M.L.Boss John wiley Publication. (For Fourier series)* 2. *Mathematical Methods in Physical Sciences 2nd Edition by M.L. Boas. John Wiley & Sons. (For Curvilinear Co-ordinates)*	1	15

Unit 2	**Quantum Mechanics** 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 & SQs.)* **Basic Reference**: *A Text Book of Quantum Mechanics by Mathews and K.Venkatesan Tata Mc-Graw Hill Publication*	1	15
Unit -3	**ELECTRONICS** **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 & SQs.)* **Solid state Devices**: Junction Field Effect Transistor (JFET) (12.1 to 12.6), Uni Junction Transistor (UJT) (26.6, 26.6.1 to 26.6.3), Silicon Control Rectifier (SCR) **Basic Reference**: 1) Hand book of Electronic by Gupta&Kumar 30th Edi, 2002 Pragati Prakashan 2) Electronics and Radio Engineering by M.L.Gupta (9th Edition-2002) DhanRaj & Sons. (For Ch-9)	1	15
Unit-4	**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.*	1	15

: Further Reading – 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
3. Quantum Quantum Mechanics by John L. Powell and Bend Crasemann
4. Quantum Mechanics by Ghatak and Lokanathan Quantum Quantum Mechanics by Schiff
5. Electronic Devices and Circuits by A. Mottershead prentice- Hall of India
6. Integrated Electronics by Milliman & Halkias
7. Basic Electronics and Linear Circuits by N. N. Bharagava, D.C.Kulshreshtha, S.C. Gupta

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–IV

TYPEOFCOURSE:MINORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23MIDSCPHY402

COURSENAME:NUCLEAR PHYSICS AND PLASMA PHYSICS

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02TeachingHoursperSemester: 30	THEORY MINOR	ExternalMarks-25 InternalMarks-25

CourseObjective:

- To understand the principles of Heat and Thermodynamics, Mathematical Theorems, Liquification of Gases
- Learns about Franck -Hertz Experiment, Bohr's Theory, Sommerfield Model
- To develope foundation in Atomic Spectra, Understand Spectroscopic terms Zeeman Effect, Paschan Back effect etc.
- To Learn Crystal Lattice and Crystal structure, the Seven crystal Systems.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Understand the principles of Heat and Thermodynamics, Mathematical Theorems, Liquification of Gases
- Learns about Franck -Hertz Experiment, Bohr's Theory, Sommerfield Model
- Learns the concepts Atomic Spectra, Understood Spectroscopic terms Zeeman Effect, Paschan Back effect
- Get sufficient knowledge of Crystal Lattice and Crystal structure, The Seven crystal Systems.

Syllabus

Unit No.	Content	Credit	Lect.Hrs30
Unit-1	**NUCLEAR PHYSICS - Radioactivity:** Introduction (2.1), Properties ofRadioactive rays(2.2), The law of Radioactive Decay(2.3) Statistical Nature ofRadioactivity(2.4), The Statistical Errors of Nuclear Physics(2.5), 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) (*Related Examples, Problems, MCQ &SQs)* **Basic reference**: *Nuclear Physics by S. B. Patel (New age International (p) Ltd. Publishers)*	1	15
Unit 2	**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 & SQs)* **Basic Reference:** *Elements of Plasma physics by S.N. Goswami New Central book Agency (p) Ltd., Calcutta.*	1	15

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER –IV (PRACTICALCOURSE)

PROGRAMMECODE: SCIUG101

(EffectivefromJune2024UnderNEP–2020)

LABORATORYEXPERIMENTS: MAJOR COURSE 2 Credit for Group A

COURSECODE: SC23PMJDSCPHY401 Group A

TYPE OFCOURSE	CREDIT	Marks	COURSECODE
MajorDisciplineCoreCourse Practical (MJDSCP)	2 (Group A)	25 CCE + 25 SEE =50	SC23PMJDSCPHY401
TeachingHours TeachingHoursperWeek:08 Hours for 4 Credit practical (120 Hours per Semester) TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)			

LABORATORY EXPERIMENT COURSE: Group A

1. To determine wavelength of bright lines of Mercury light using Grating.
2. To Find out of Resolving Power of Telescope.
3. Study of X –ray diffraction using Powder pattern.
4. A Study of Decay of Temperature when body is allowed to cool (Thermocouple).
5. To study elliptically polarized light using Photocell and quarter wave plate.
6. To find out Activation energy of a Semiconductor. .
7. Numerical Analysis (Newton's Forward and Backward Interpolation Formula)
8. To Find out The Resolving Power of Prism.
9. To determine wavelength of monochromatic light by Edser's 'A' Pattern
10. Trapezoidal Simpson's rule for Numerical Integration

CourseObjectives:

- Togainpracticalknowledgebyapplyingtheexperimentalmethodtocorrelatewiththe Physicstheory.
- Toprovidehandsonexperiencewithequipmentsuchas,spectrometer, A pattern, quarter wave plate, Travelling Microscope,Telescope etc.
- Toimpartpracticalknowledgebyperformingexperimentsbasedontheprinciplesoftheorycourses.
- Toprovidetraininghow toanalyzetheexperimentaldataandgraphicalanalysis.
- Todevelopintellectualcommunicationskillsanddiscussthebasicprinciplesofscientific conceptsinthegroup.

CourseOutcome:LearningOutcomes:

Bytheendofthecourse,thestudentswillbeableto,

- Gainspracticalknowledgeofexperimentalmethods and Get sufficient knowledge about equipmentslike,spectrometer, A pattern, quarter wave plate, Travelling Microscope, Telescope etc.
- Determinewavelength, resolving power, electricalandopticalproperties.
- Get sufficient knowledgebyperformingexperimentsbasedontheprinciplesoftheorycourse.
- Analyzeand understands theexperimentaldataandgraphicalanalysis.
- Developthe communicationskillsby discussing basicprinciplesofscientific conceptsinthegroup.

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER –IV (PRACTICALCOURSE)

PROGRAMMECODE: SCIUG101

(EffectivefromJune2024UnderNEP–2020)

LABORATORYEXPERIMENTS: MAJOR COURSE 2 Credit for Group B

COURSECODE: SC23PMJDSCPHY401 Group B

TYPE OFCOURSE	CREDIT	Marks	COURSECODE
MajorDisciplineCoreCourse Practical (MJDSCP)	2 (Group B)	25 CCE + 25 SEE =50	SC23PMJDSCPHY401
TeachingHours TeachingHoursperWeek:08 Hours for 4 Credit practical (120 Hours per Semester) TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)			

LABORATORY EXPERIMENT COURSE: Group B

1. To Determine Current Sensitivity, Voltage Sensitivity, Figure of Merit and Rg of B.G
2. To Determine High Resistance by equal Deflection Method.
3. To Determine Low Value of 'C' using Schering Bridge.
4. Study of Characteristics of a Photodiode and Draw the Graph of $I_D \rightarrow V_D$.
5. Comparison of Capacity (C1/C2) by De-Sauty Method
6. Low Resistance by Method of Projection.
7. Lagrange's forward Formula and Backward Formula (Interpolation)
8. To find the H-Parameter's from The Transistor in Common Emitter Configuration.
9. To Study of Half Adder and Full Adder
10. To Study of the SCR Characteristics.

CourseObjectives:

- Togainpracticalknowledgebyapplyingtheexperimentalmethodtocorrelatewiththe Physicstheory.
- Toprovidehandsonexperiencewithequipmentsuchas, B G, Schering bridge, Transistor, SCRetc.
- Toprovidetraininghow toanalyzetheexperimentaldataandgraphicalanalysis.
- Todevelopintellectualcommunicationskillsanddiscussthebasicprinciplesofscientific conceptsinthegroup.

CourseOutcome:LearningOutcomes:

Bytheendofthecourse,thestudentswillbeableto,

- Gainspracticalknowledgeofexperimentalmethods and Get sufficient knowledge about equipmentslike,B G, schering bridge, transistor, SCRetc.
- Determinecurreent sensitivity, voltage sensitivity, capacity, low and high Resistance.
- Analyzeand understands theexperimentaldataandgraphicalanalysis.
- Developthe communicationskillsby discussing basicprinciplesofscientific conceptsinthegroup.

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER –IV (PRACTICALCOURSE)

PROGRAMMECODE: SCIUG101

(EffectivefromJune2024UnderNEP–2020)

LABORATORYEXPERIMENTS: MINOR COURSE 2 Credit

COURSECODE: **SC23PMIDSCPHY402**

TYPE OFCOURSE	CREDIT	Marks	COURSECODE
MinorDisciplineCoreCourse Practical (MIDSCP)	2	25 CCE + 25 SEE =50	SC23PMIDSCPHY402
TeachingHours TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)			

LABORATORY EXPERIMENT :: MINORCOURSE

1. To determine wavelength of bright lines of Mercury light using Grating.
2. To Find out of Resolving Power of Telescope.
3. Study of X –ray diffraction using Powder pattern.
4. To study elliptically polarized light using Photocell and quarter wave plate.
5. To find out Activation energy of a Semiconductor. .
6. To Determine Low Value of ‘C’ using Schering Bridge.
7. Study of Characteristics of a Photodiode and Draw the Graph of $I_D \rightarrow V_D$.
8. Comparision of Capacity (C1/C2) by De-Sauty Method
9. Low Resistance by Method of Projection.
10. Lagrange’s forward Formula and Backward Formula (Interpolation)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. SEMESTER – IV

TYPE OF COURSE: VALUE ADDED COURSE

PROGRAM CODE: SCIUG101 COURSE CODE: SC23VACPHY405

COURSE NAME: SHRIMAD BHAGVAD GITA & STRESS MANAGEMENT IN LIFE"

("શ્રીમદ્ ભગવદ્ગીતા અને તણાવનું વ્યવસ્થાપન)

(Effective from June 2024 under NEP 2020)

Total Credit : 02 Teaching Hours per Week : 02 Teaching Hours Per Semester : 30	THEORY VAC	External Marks : 25 Internal Marks : 25

Course Objective:

- To provide awareness and knowledge about Vedas and Shrimad Bhagvad Geeta.
- To Introduce students to background of Mahabharata and Role of Shri Krishna in Mahabharata.
- To discuss the importance of Arjunvishadyog.
- To draw attention of students, how to handle stress management in life.
- To aware about karmyog in life management.

Course Outcome:

After the successful completion of the course students will be able to understands,

- Vedas, Upanishad and Shrimad Bhagvad Geeta and composer of them.
- The Mahabharata and Role of Shri Krishna in Mahabharata.
- Conflict Faced by Arjun (Arjunvishadyog) and How Shrikrishna solve Arjun's Stress and Inner Conflict. Also How bhagavad geeta address the inner conflict and stress.
- How to handle stress management in life.
- The karmyog in life management.

Syllabus

UNIT I **INRODUCTION OF SHRIMAD BHAGAVAD GEETA AND ARJUNVISHADYOG** • Background of Mahabharatand Veda Vyas -as a Composer of Mahabharat(Maharishi Krishna Dwaipayana) • Fundamentals of Veda-Upanishads and relation with Shrimad Bhagavad Geeta • Background, Status and Form of Shrimad Bhagvad Gita in Mahabharat. • Relevance and Necessity of Shrimad Bhagvad Gita's Teaching • Ethics, Philosophy and psychology of Shrimad Bhagavad Geeta • Role of Shri Krishna in Mahabharata • Shrikrishna – A Great Diplomater – Farsighted (Ran nitikar) • Kurukshetra Conflict and Reason મહાભારત મહાકાવ્યની પૃષ્ઠભૂમિ અને તેના રચયિતા મહર્ષિ વેદવ્યાસનો પરિચય, વેદ-ઉપનિષદન મૂળભૂત ખ્યાલ અને શ્રીમદ ભગવદ્ ગીતા સાથે સંબંધ, શ્રીમદભગવદ્ ગીતાની પૃષ્ઠભૂમિઅને સ્વરુપ, શ્રીમદ ભગવદ્ ગીતાની પ્રાસંગિકતા અને તેના અભ્યાસની જરુરિયાત, શ્રીમદ ભગવદ્ ગીતાનું નીતિશાસ્ત્ર, દર્શનશાસ્ત્રઅને મનોવિજ્ઞાન, મહાભારતમાં ભગવાન શ્રીકૃષ્ણની ભુમિકા, ભગવાન શ્રીકૃષ્ણપ્રખરરણનિતિકાર --મુત્સદિકાર, વ્યવસ્થાપનકાર તરીકે ઓળખ, કુરુક્ષેત્ર રણભૂમિનો સંઘર્ષ અને કારણો	1 credit 15 Hours

UNIT II **CONCEPTS OF STRESS MANAGEMENT : SAANKHYAYOG** • Stress, Anxiety, Conflict Faced by Arjun in the Battle Field of Kurukshetra. • Reasons of Stress, Anxiety, Conflict Faced by Arjun. • How Shrikrishna solve Arjun's Stress and Inner Conflict. • Duty Teaching of Shrikrishna to Arjun. • Understanding the Truth about Self and Supreme. . • Characteristics of ignorant and knowledgeable. • Composmentis and its Glory : According to Bhagavan Shri Krishna. • Concept of "karma" explained by Bhagavan Shri Krishna. • Types and Reasons of Conflicts and Stress in Life and Solution through GEETA. • Importance of Sankhya Yog of ShrimadBhagvad Gita for life management. કુરુક્ષેત્ર રણભૂમિ માં અર્જુનને થયેલ તણાવ, ચિંતાઉચાટઅને સંઘર્ષ-, અર્જુનના તણાવ, ચિંતાઉચાટઅને -સંઘર્ષના કારણો, ભગવાન શ્રીકૃષ્ણએ અર્જુનના તણાવ, ચિંતાઉચાટઅને સંઘર્ષને કેવી રીતે દૂર કર્યો-? , ભગવાન શ્રીકૃષ્ણએ અર્જુનને આપેલ કર્તવ્યબોધ, ભગવાન શ્રીકૃષ્ણ દ્વારા નિરુપાયેલ સ્વ અને સર્વોચ્ચ બાબતે સત્યની સમજણ, અજ્ઞાની અને ગુણવાન વ્યક્તીના લક્ષણો ભગવાન શ્રીકૃષ્ણની દ્રષ્ટીએ -, ભગવાન શ્રીકૃષ્ણની દ્રષ્ટીએ સ્થિતપ્રજ્ઞ પુરુષ અને તેનો મહિમા, ભગવાન શ્રીકૃષ્ણએ સમજાવેલ કર્મનો ખ્યાલ અને તેના પરિણામ, વ્યક્તિગત જીવનમાં ઉદભવતા સંઘર્ષોતણાવોના પ્રકાર અને કારણો -, જીવન વ્યવસ્થાપન માટે શ્રીમદ ભગવદ્ ગીતાના સાંખ્યયોગ નું મહત્વ(બીજા અધ્યાય)	1 credit 15 Hours

Basic Reference :મુખ્ય સંદર્ભ:

1. Shrimad Bhagavad Geeta : Original Text svarupe) (શ્રીમદ ભગવદ્ ગીતા (મૂળ સ્વરુપે :
2. Book on Geetabhashya by Aadi Shankaracharya (ગીતાભાષ્યલે .આદિશંકરાચાર્ય(
3. Geeta rahasya by Bal Gangadhar Tilak – (ગીતારહસ્યલે .બાલગંગાધરતિલક(
4. Essays on Geeta, by Shree Aurobindo, Sri Aurobindo Ashram, Pandichery (એસેઝઓનગીતાલે . શ્રીઅરવિંદઘોષ)
5. Stress Management : as per Shrimad Bhagavad Geeta , Kindle publication
6. Shrimad Bhagavad Geeta (gujarati) Gorakhapur GeetaPress
7. Shrimad Bhagavad Geeta (kuruXetra) sampadak- Shastri Hariprakash (BHU), Svaminarayan Gurukul, Gandhinagar
8. Bhagavd Geeta for Executives: V. Ramanathan, Bharatiya Vidhyabhavan, Bombay

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–IV

TYPEOF COURSE:SKILL ENHANCEMENTCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23SECPHY406

COURSENAME:ASTRO / SPACE PHYSICS

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02 TeachingHoursperSemester: 30	THEORY SEC I	ExternalMarks–25 InternalMarks-25

Course Objectives:

1. To provide a comprehensive understanding of the sun as a star and its structure.
2. To learn about sun's outer layers and solar activity.
3. To know use of instrument like Spectroheliograph and common features of sun.

Course outcome:

After the successful completion of the course students will be able to

1. Develop a understanding of description of sun and its structure.
2. Understand about sun's different outer layers and sunspot.
3. Gain knowledge about common features of sun.

:: Syllabus ::

Unit No.	Content	Credit	Hrs 30
Unit-1	**Sun and S olar 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.	1	15
Unit-2	**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	1	15
Reference:*An Introductory Course on Space Science and Earth's Environment by S.S.Degaonker (Gujarat University Publication, Ahmedabad)*			

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–IV

TYPEOF COURSE:SKILL ENHANCEMENTCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23SECPHY406A

COURSENAME:TRANSDUCER AND SOUND

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:02 TeachingHoursperWeek:02 TeachingHoursperSemester: 30	THEORY SEC II	ExternalMarks–25 InternalMarks-25

Course Objectives:

- To understand the principles of Transducers and Sabine's empirical formula
- Learns about various types of Microphones
- To develop foundation in acoustics.
- To Learn To understand the measurement time of reverberation

Course outcome:

After the successful completion of the course students will be able to

- Understand the principles of Transducers.
- Learns about various types of Microphones.
- Learns the concepts acoustics Get sufficient knowledge of Sabine's empirical formula.
- Understand and can the measurement time of reverberation.

:: Syllabus ::

Unit No.	Content	Credit	Hrs 30
Unit-1	**Microphone and Loudspeaker:** Introduction, Carbon Microphones, Hot wire Microphones, Condenser Microphone, Moving Coil electrodynamic microphone, Crystal Microphone, Ribbon or velocity Microphone, Hydrophone, Loudspeaker. **Speech and Hearing:** Human voice, Hearing ear and its structure, Mechanism of hearing, Helmhotlz theory of audition, Thresold of hearing	1	15
Unit-2	**Architectural Acoustics:**Architectural acoustics and Sabine's empirial formula, Reverberation time of a live room, dead room, Optimum reverberation time, Measurement of time of Reverberation,Measurement of absorption co efficient, Specific acoustic impedance, power relation, Transient response of an oscillator, Filter. **Musical Sound:**Musical sound, Principle features of musical sound- Pitch, Quality or Timber,Musical Scale	1	15
Reference:*ATextbook of oscillation, waves and Acoustics by Dr M Ghosh & Dr D Bhattachaarya S. Chand 5th edition*			

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–III&IV

SemesterEndExamination (SEE)

(EffectivefromJune2024UnderNEP–2020)

FORMATFORQUESTIONPAPER4

CREDITCOURSEINPHYSICS(MAJORDISCIPLINESPECIFICCOURSE)

PROGRAMMECODE: SCIUG101

COURSECODE:SC23MJDSCPHY301or**SC23MJDSCPHY301A**

SC23MJDSCPHY401or**SC23MJDSCPHY401A**

TheuniversityExternal examination(SEE) paperconsistsoffourquestions.

- 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/SQ)	08 04
Que–2	(A)AttemptanyTwooutofThree.(TheoryLongQuestions) (B)AttemptanyOneoutofTwo(Application/Example/ShortNote/SQ)	10 03
Que–3	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo.(Application/Example/ShortNote/SQ)	08 04
Que-4	(A) AttemptanyTwooutofThree.(TheoryLongQuestions) (B) AttemptanyOneoutofTwo(Application/Example/ShortNote/SQ)	10 03
	Total	50

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN
B.Sc.PHYSICS-SEMESTER–III(MULTI)
SEMESTER–IV (MINOR)

SemesterEndExamination (SEE)
(EffectivefromJune2024UnderNEP–2020)

FORMATFORQUESTIONPAPER2CREDITCOURSEINPHYSICS(MINOR AND MULTIDISCIPLINERYSPECIFICCOURSE)

PROGRAMMECODE:SCIUG101
COURSECODE:SC23MDCPHY303 (MULTI)
SC23MIDCPHY402**(MINOR)**

Theuniversityexaminationpaperconsistsoffourquestions.
Firstquestionisof12marksandwillbefromUnit–I.
Secondquestionisof13marksand willbefromUnit–II.

1. Thisquestion papercontainsthree questions.Allquestionsarecompulsory.
2. Figuresatrightsideindicatethemarksofquestion.
3. Illustrateyouranswerwithproperdiagram/figure

		Marks
Que–1	(A) AttemptanyTwooutofThree.(TheoryLongQuestions)	08
	(B) AttemptanyOneoutofTwo.(Example/Shortnote/SQ)	04
Que – 2	(A) AttemptanyTwooutofThree.(TheoryLongQuestions)	10
	(B) AttemptanyOneoutofTwo.(Example/Shortnote/SQ)	03
	Total	25

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–III&IV

SemesterEndExamination (SEE)

(EffectivefromJune2024UnderNEP–2020)

FORMATFORQUESTIONPAPER2 CREDITCOURSEINPHYSICS

(SKILLENHANCEMENTCOURSE)

PROGRAMMECODE:SCIUG101

COURSECODE:SC23SECPHY306 or 306A (SEM-III)&SC23SECPHY406 or 406A (SEM-IV)

TheuniversityexaminationpaperconsistsofTwoquestions.

Firstquestionisof12marksandwillbefromUnit–I.

Secondquestionisof13marksand willbefromUnit–II.

- Thisquestion papercontainsTwo questions.Allquestionsarecompulsory.
- Figuresatrightsideindicatethemarksofquestion.
- Illustrateyouranswerwithproperdiagram/figure

		Marks
Que–1	A. AttemptanyTwooutofThree.(TheoryLongQuestions) B. AttemptanyOneoutofTwo.(Example/Shortnote)	08 04
Que – 2	A. AttemptanyTwooutofThree.(TheoryLongQuestions) B. AttemptanyOneoutofTwo.(Example/Shortnote) Total	10 03 25

COURSE NAME: INDIAN KNOWLEDGE SYSTEM

B.Sc.PHYSICS-SEMESTER–III

PROGRAMMECODE:SCIUG101

COURSECODE:SC23IKSPHY305&SC23IKSPHY305A

TheUniversityExaminationPaperConsistsofThreequestions.

Firstquestionisof10marksandwillbefromUnit–I.

Secondquestionisof10 marksand willbefromUnit–II.

Third question is of 5 marks and will be from Unit I and II

- Thisquestion papercontainsthree questions.Allquestionsarecompulsory.
- Figuresatrightsideindicatethemarksofquestion.
- Illustrateyouranswerwithproperdiagram/figure

		Marks
Que–1	AttemptanyTwooutofThree.(LongQuestions, fromUnit–I.)	10
Que – 2	AttemptanyTwooutofThree.(LongQuestions, fromUnit–II)	10
Que – 3	AttemptanyOne outofTwo.(LongQuestions, fromUnit–I & II)	05
	Total	25

PROGRAM CODE : SCIUG102
Syllabus and Scheme of Examination
for

Sem. III and Sem. IV 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, 2024

Submitted on March, 2024

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
(c) Journal/ Practical Report(Certified)	10 (5+5)
(d) Viva voce	10 (5+5)

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. For each semester in IInd year, there will be 550 marks per semester, for both semester III and IV. At end of IInd year for completion of **Diploma course** at the time of exit, the total marks will be given out of 2300 (1100+1100+100). The cumulative grade will be given as per university rules.
15. **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

16. For internal remuneration, four hours of Practical's should be considered equivalent to two hours of theory.

17. For conducting practicals, batch size should be with Minimum 10 students and should not exceed more than 20 as per circular by education department under Gujarat public act 2023 on January 20, 2024.

18. For conducting external practical examinations

(Major Discipline Course)	Marks (out of 50)
(a) Internal practical exam Group A	15
(b) Internal practical exam Group B	15
(c) Journal/ Practical Report(Certified)	10 (5+5)
(d) Viva voce	10 (5+5)

(Minor/ Multi/ Interdisciplinary Course)	Marks (out of 25)
(a) Internal practical exam	15
(b) Journal/ Practical Report(Certified)	05
(c) Viva voce	05

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

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

Semester	Type Of Course Opted	Course Name	Course Code	Credits	Examination			Total Marks
					Internal	External	Examination Hours	
III	Major Discipline Specific course MJDSC-I	Basic of Chemistry- I	SC23MJDSCCHE301	4	50	50	2.30	100
	Major Discipline Specific course MJDSC-II	Basic chemistry -1I	SC23MIDSCCHE301A	4	50	50	2.30	100
	Major Discipline Specific course MJDSC-III Practicals	PMJDC Practical -I & II Lab Group A & Group B	SC23PMJDSCCHE301	4	50	50	2.30	100
	Multi/Inter disciplinary Course MDC/IDC	Simplified chemistry-I	SC23MDCCHE303	2	25	25	2.00	50
	Multi/Inter disciplinary Course MDC/IDC Practicals	PMDC/PIDC Practical- Lab	SC23PMDCCHE303	2	25	25	2.00	50
	Ability Enhancement Courses AEC	To be Selected (From languages)	SC23AECCHE304	2	25	25	2.00	50
	Indian Knowledge System IKS	To be Selected (Basic concept of IKS)	SC23IKSCHE305	2	25	25	2.00	50
	Skill Enhancement Course SEC	To be selected SEC-I Environmental Pollution or SEC-2 Chemical Metallurgy	SC23SECCHE306/ SC23SECCHE306A	2	25	25	2.00	50
	Total Credits of Semester - III			22	275	275		550

IV	Major Discipline Specific course MJDSC -1	Basic Chemistry- III	SC23MJDSCCHE401	4	50	50	2.30	100
	Major Discipline Specific course MJDSC-II	Basic Chemistry- IV	SC23MJDSCCHE401A	4	50	50	2.30	100
	Major Discipline Specific course MJDSC -1II Practicals	PMJDC Practical -I & II Lab Group A & Group B	SC23PMJDSCCHE401	4	50	50	2.30	100
	Minor Discipline Specific course MIDSC	To be Selected Simplified chemistry -I	SC23MIDSCCHE402	2	25	25	2.00	50
	Minor Discipline Specific course MIDSC Practicals	Practical's for simplified chemistry I	SC23PMIDSCCHE402	2	25	25	2.00	50
	Ability Enhancement Courses AEC	To be Selected (From languages)	SC23AECCHE404	2	25	25	2.00	50
	Value Added course VAC	To be Selected (VAC Bhartiya Science & Technology)	SC23VACCHE405	2	25	25	2.00	50
	Skill Enhancement Course SEC	To be Selected SEC-1 Green chemistry or SEC-2 Ceramics	SC23SECCHE406/ SC23SECCHE406A	2	25	25	2.00	50
	Total Credits of Semester - IV			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

D. Common Formula for External Practical Examination

Sr. no.	Details	Marks Major Course		Marks (MI /MDC)
		Group A	Group B	
1	Experiment (do any one)	15	15	15
2	Viva	05	05	05
3	Certified Journal	05	05	05
4	Total	25	25	25
5	time	2.30 Hr	2.30 Hr	2.00 Hr

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name : B. Sc. Chemistry Semester : IV
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MJDSCCHE401

Type of course : Major Discipline Specific course
Name of course : Basic chemistry III 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 have knowledge on noble gases and their uses..
2. To understand chemistry of aminoacids and peptides and their application.
3. To study about polycyclic aromatic hydrocarbons and their relevant reactions.
4. To know about the role of ionic equilibrium in electrochemistry.

Course Outcome:

1.Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in 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 conductometric titrations and calculations for estimation of components in mixtures.

Unit	Topic	Credit	Hr
1	**Chemistry of Noble gases.** Introduction Discovery of Noble gases: Occurrence, Isolation of Non- radioactive Of Noble gases. Electronic configuration of Noble gases. Compound of Noble gases. Non real compounds prepared by different methods. True compounds: XeF_2, XeF_4, XeF_6, $XeOF_2$, XeO_2F_2, $XeOF_4$, XeO_3, XeO_4.	1	15
2	**Amino Acid & Peptides.** **Amino Acid** Introduction, Classification and nomenclature, Acid-Base Behavior (zwitterion) and Isoelectric point Synthesis of amino acids (GabrielPhthalimide, Straker, Fisher-melonic ester), Chemical properties and reaction of amino acids **Peptides** Structure and nomenclature of peptide, Structure determination of peptide, End group analysis (C-terminal & N-terminal) Synthesis of Peptide (Bergmann, Azide, Shehan)	1	15
3	**Poly Cyclic Aromatic Hydro Carbon.** Introduction, Nomenclatureof naphthalene, Anthracene, Phenanthrene and its derivatives Synthesis of Naphthalene Anthracene, Phenanthrene Chemical Reactions (oxidation, reduction and electrophilic, substitution reaction (ESR)) of naphthalene, Anthracene, Phenanthrene Carcinogenic hydrocarbon .	1	15
4.	**Ionic Equilibrium** Introduction , Electrolysis, Ionic equilibrium, Resistance,	1	15

	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. Relevant Numericals. Types of Condctometric titration Acid Base titration: Strong acid Vs Strong base, Strong acid Vs Weak base, Weak acid Vs Strong base, Weak acid Vs Weak base, Strong acid + Weak acid Vs Strong base. Hydrolysis of salt: Classification of salt, Derive pH equation for hydrolysis of strong acid & weak base Salt, Derive pH equation for hydrolysis of weak acid & strong base salt, Derive pH equation for hydrolysis of weak acid & weak base salt. Numericals.		

Books Recommended:

➢ **Inorganic Chemistry**

1. Inorganic chemistry, Catherine E. house croft, 5 th edition, Pearson , 2018.

2. Concise Inorganic Chemistry J.D.Lee, 4th edition, ELBS publication.

3. Inorganic chemistry, Manas chandra, Oxford Pubishers, 1998.

➢ **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 ArunBahal 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 GurdeepR.Chatwal 4th ed. Himalaya public House.

7. Text book of Organic Chemistry by ArunBahal, B.S.Bhal, 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.Misra.
5. Essentials of Physical Chemistry by B.S.Bahal, ArunBahal, 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 Wiley, 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.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name : B. Sc. Chemistry Semester : IV
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MJDSCCHE401A

Type of course : Major Discipline Specific course
Name of course : Basic Chemistry IV 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 inner transition metal complexes.
2. To understand acid base organic chemistry i.e. resonance, inductive effect etc. and their explanations.
3. To study about the phase rule and types of reactionsphase reactions.
4. To know about the colorimetery and spectrophotometery for various applications.

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 analytical toolslike spectrophotometery for industrial practical applications.

Unit	Topic	Credit	Hr
1	**F Block Elements** **[A] Lanthanides:** Inner transition elements, position in the Periodic Table, Lanthanides: General Characteristics, (Electronic Configuration, Oxidation States, Oxidation Potential, Colour, MegneticProperies, Isotopes, Chemical Reactivity, Formation of Complex, Ionization Potential), Lanthanide Contraction, Effect of Actinide Contraction, Occurrence and Extraction of Lanthanides, Separation of Lanthanide elements, (Ion exchange method and Solvent Extraction Method.) **[B] Actinides:** General Characteristics (Electronic Configuration, Oxidation States, Atomic and Ionic radii, Actinide Contraction, Formation of Coloured salts, Formation of complex, Magnetic Properties). Occurrence and Isolation of Uranium, Use of Uranium, Preparation of Neptunium, Plutonium, Americium, Curium from Uranium.	1	15
2	**Acid-Base Properties**. Introduction: 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 of hydrogen bonding	1	15
3	**Phase rule**. 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: water system, Sulphur system, Reduced phase rule of condensed system,	1	15

	Two component system: Pb - Ag system, Zn - Mg system, KI - water system, Dehydration of $CuSO_4 \cdot 5H_2O$, Steam distillation Numericals.		
4.	**Calorimetry & Spectrophotometry.** Principle of colorimetry, Laws of Light: Groths - Drappers's Law, Lambert - Beer's Law. Various terms: Absorptivity, Optical density, Molar absorptivity, %transmission, - Relation between absorptivity and % transmission, deviation of Lambert - Beer's law. Applications of Lambert - Beer's law, Problem solving in colorimetry: Standard series method and Dilute method Basic differences in colorimer and spectrophotometer .Description of single beam and double beam spectrophotometry (Source for irradiation, Monochrometer, Wave selector, cuvette or sample holding vessel, detectors Working with spectrophotometer, probable error in working with spectrophotometer, study and evaluation of two components in the mixture. Numericals.	1	15

Books Recommended:

➢ Inorganic Chemistry

1. . Inorganic chemistry, Catherine E. house croft, 5 th edition, Pearson , 2018.

2. Concise Inorganic Chemistry J.D.Lee, 4th edition, ELBS publication.

3. Inorganic chemistry, Manas chandra, Oxford Pubishers, 1998.

➢ 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 ArunBahal 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 GurdeepR.Chatwal 4th

ed. Himalaya public House.

7. Text book of Organic Chemistry by ArunBahal, B.S.Bhal, 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.Misra.

5. Essentials of Physical Chemistry by B.S.Bahal, ArunBahal, 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 Wiley, 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.

Analytical chemistry

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 : IV**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMJDSCCHE401

Type of Course : Practicals Major Discipline Specific Course PMJDSC
Name of Course : Practical's for Basic 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 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 for various estimations.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in organic separations for carrying out reactions.
2. To understand basic methods to identify the compounds on the basis complexometric titrations.

Sr.No.	List of Practicals	Credit	Hr
GROUP A	**Organic chemistry** Separation of mixtures (any 10) Mixture should have two compounds and the compounds should be water insoluble.	2	60

GROUP B	Inorganic Quantitative analysis. (Any 10) 1. Estimation of Ca by complexometric titration. 2. Estimation of Mg by complexometric titration. 3. Estimation of Cu by EDTA complexometric titration 4. Estimation of Cu by Iodometrical titration 5. To estimate ferrous (Fe^{+2}) and ferric (Fe^{+3}) ions given in the mixture. 6.To determine the strength of Ferrous ammonium sulphate by $K_2Cr_2O_7$. 7. To determine the amount of Zn by EDTA Method. 8. To determine the amount of Ni by EDTA Method. 9. Estimation of Glucose/Aniline/Phenol 10. To determine the amount of Aniline by Brominating Method. 11. To determine the amount of Phenol by Brominating Method. 12. To determine the amount of Glucose by oxidation Method	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 : IV**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MIDSCCHE402

Type of course : Minor Elective course MIDSC
Name of course : Simplified 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 electrochemistry.
2. To understand role of electrodes and their applications.

Course Outcome:

1. Students will have a firm foundation in the fundamentals and application of elctro chemistry and scientific theories applicable to 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 practicals related to generation of current.

Unit	Topic	Credit	Hr
1	**Electro Chemistry** Introduction of terms: Oxidation, Reduction, Redox, Anode Cathode, Electrode, Half-cell Oxidation & Reduction Potential Electo chemical Cell (Galvanic Cell) 2 Representation Cell. Electo chemical series and its Significance. Nearest Equation of cell EMF and Single electrode potential. Describe the Electrode (Metal – Metal ion Electrode, Standard – Hydrogen Electrode, Calomel Electrode, Weston standard Electrode, Glen Electrode, Quienhydron Electrode)	1	15

	Application of cell potential to find out Equilibrium constant, Free Energy and PH Numericals		
2	**Inorganic Polymers** Classification of Inorganic polymers Polymers containing boron: Borazine, preparation and properties and structure of Borazine, Substituted borazines, Boron nitride Polymers containing Silicones, preparation and properties of Silicones, Types of Silicones. Plymers containing phosphorus, Types of Polymers containing phosphorus, Preparation and properties and Structure of Poly phosphonitritic chlorides, Plyorthophosphoric acid, Borophosphateglases Polymeric compounds of Sulphur, Nirides of sulphur,Thiazylhalides,Imides of sulphur	1	15

Books Recommended:

1. Electroanalytical methods, Allen j, Bard, Springer, 2000.
2. Electrochemistry by S. Glasstobne, 3rd edn, Oxford University Press, 1956.
3. 'Physical chemistry by s. Glasston, Oxford University Press, 1960.
4. 'electrochemistry by I O Bockris,, vol 1, 2, 3, Francis and taylor, 1990.
5. Inorganic polymers by James E. Mark, Oxford publisher 2005.
6. Inorganic polymers by Chatwal, Himalyan publishers, 2018.

Further Reading:

1. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
2. Physical Chemistry by P.W.Atkins. 5th edn.Oxferd 1994 7thedn-2002.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : IV**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMIDSCCHE402

Type of Course : Practicals Minor (Elective) Discipline Specific Course PMIDSC
Name of Course : Practical's for simplified 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 learn complexometric titrations.
2. Preparation of solutions and required standardization.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in standardization and preparation of solutions for carrying out complexometric titrations.
2. To understand basic methods to estimate the metal ionss on the basis of complexation with ligands.

Sr.No.	List of Practicals	Credit	Hr
1	Inorganic Quantitative analysis. (Any 10) 1. Estimation of Ca by complexometric titration. 2. Estimation of Mg by complexometric titration. 3. Estimation of Cu by EDTA complexometric titration 4. Estimation of Cu by Iodometrical titration 5. To estimate ferrous (Fe^{+2}) and ferric (Fe^{+3}) ions given in the mixture. 6.To determine the strength of Ferrous ammonium sulphate by $K_2Cr_2O_7$. 7. To determine the amount of Zn by EDTA Method. 8. To determine the amount of Ni by EDTA Method.	1	30

	9. Estimation of Glucose/Aniline/Phenol 10. To determine the amount of Aniline by Brominating Method. 11. To determine the amount of Phenol by Brominating Method. 12. To determine the amount of Glucose by oxidation Method		

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

Program Name **: B. Sc. Chemistry Semester V**

PROGRAM CODE: SCIUG102

COURSE CODE: SC23VACCHE405

Type of course : Value Added Course VAC
Name of course : Bhartiya Science and Technology **Total Mark : 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 Bhartiya science and tecchnology
2. To have knowledge about contribution of Bhartiya science and tecchnology.
3. To know about great mathematicians to our culture.

Course Outcome:

1. Students will gain a comprehensive knowledge of Bhartiya science and tecchnology.
2. To raise awareness among students about Bhartiya science and tecchnology.
3. Students will develop faith and honor about our culture.

Unit	Topic	Credit	Hr
1	**Fundamentals of Bhartiya science and tecchnology** An overviw of indian contribution to technology, technological innovations, Metullrgy, Textile andchemistry: copper/ bronze/Zinc/ gold/ Silver Iron and steel technology, textile and dyeing Chemistry -1: Traditional chemical practices in India- pottery, mortar, cement, essential oils, Chemistry II: Tradittions medical systemsin India Ayurveda, surgery, anatomy, nanoscience.	1	15

2	**Ancient applications of bhartiya technology** Management: Harappa water management, other case studies,Medieval water structures, Transportation: modes of transpotation and its reforms, development of trading activities, Mathematics: development of mathematics in india, Great mathematicians and their contribution. Unique aspects of mathematics,	1	15

Books Recommended:

1. Science and Technology in ancient indian texts,, Bal Ram singh, girish Nath jha, D K Print publisher, 2012.

2. Ancient hindu science, Alok kumar, Jaco publishing house, 2019..

3. Engineering and technology in ancient India, Ravi kumar Arya, krishna publisher, 2022.

Further Reading:

1. Traditional knowledge system, Amit Jha, Atlantic publisher, 2019.
2. A modern introduction to ancient Indian Mathematics, T S Bhanu moorty, New age international publishers, 2008.
3. Vedic physics, Keshav Das verma, motilal banaridas publisher, 2012.

Suggestive Digital Platforms Web Links:

1. http://www.phindia.com
2. https://www.garudabooks.com
3. https://www.exotiindiaart.com/
4. https://www.anaadi.org

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : IV**
PROGRAM CODE : SCIUG102
COURSE CODE: SC23SECCHE406

Type of course : Skill Enhancement course SEC
Name of course : Green chemistry

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 02 Teaching hours per semester: 30	**Theory Mark: 50**	External 25 Marks Internal 25 Marks

Course Objectives:

1. To understand importance of taking precautions in study of Chemical reactions in greener way.
2. To have knowledge of lab wastage and save the chemicals.
3. To know about designing green synthesis .

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in assessing laboratory reagents and use of them in greener ways.
2. To understand the importance of cost of chemicals, environment protection and safety in performing green experiments.
3. Students will learn how to use chemicals in greener ways and makngichemical laboratories.

Unit	Topic	Credit	Hr
1	**BASICS OF GREEN CHEMISTRY:** Introduction of green Chemistry, Twelve principles of green chemistry. Green products, recycling of waste, Green Fuels methods:Natural gas reforming Methods. Coal gasification Process. Hydrogen gas, Biomass gasification, Eco-efficiency-environmental protection laws. Inception of green chemistry-awards for green chemistry.International organizations promoting green chemistry.	1	15

2	**Designing Green Synthesis** 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. Green approaches in synthesizing of Nanomaterials (ZnO, TiO_2) for environment. Examples – Adipic acid, Catechol, Methyl methacrylate, Urethane, Aromatic amines (4-aminodiphenylamine), Benzyl bromide, Acetaldehyde, Citral, Ibuprofen, Paracetamol, Asprin.	1	15

Books Recommended:

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, Krihna publications, 2016
4. Chemistry of Fosil Fuels and fuels, Harold H Schobert First published 2013 ISBN 978-0-521-11400-4

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 : IV**
PROGRAM CODE : SCIUG102
COURSE CODE: SC23SECCHE406A
Type of course : Skill Enhancement course SEC
Name of course : Ceramics **Total Mark: 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 ceramics used in day todaylife
2. To have knowledge of basic of raw materials used inceramic industry.
3. To know about primary and secondary kilns needed for ceramic manufacture .

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in assessing laboratory testing needed for ceramic industry.
2. To understand the importance ceramics for practicl utility
3. Students will oftion to ceramic industry as carrer.

Unit	Topic	Credit	Hr
1	**Introduction of ceramics**, Definition and 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 Industrial uses of ceramics modern ceramics – Hi-tech Ceramics-Sub-division in Ceramics.	1	15

2	**Property Measurement Of Ceramic & Refractories** 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 refractories Manufacturing process of silica bricks	1	15

Books Recommended:

1. 1. Industrial ceramics – Felix singer and Sonja S. Singer, Springer, august 2014.
2. Ceramics technology and processing Alan G. king
3. Modern industrial ceramics, Stafford, Macmillian publishing company,1980.
4. Source book of Ceramics, part-1 and 2 by S.Kumar, Krishna publishers 2022.

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

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NAAC "A" (3.02) State University

वसुधैव कुटुम्बकम्
ONE EARTH • ONE FAMILY • ONE FUTURE

पावका नः सरस्वती

FACULTY OF SCIENCE

B.Sc. (Honours) BOTANY

(With Research/without Research)

SCIUG103

Semesters: III and IV

(with multiple entry & exit option)

DIPLOMA SYLLABUS

Curriculum as per UGC Guideline

Framed according to National Education Policy (NEP) - 2020

With effect from June – 2024 (and thereafter)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

PATAN - 384 265

NAAC "A" (3.02) State University

B.Sc. (Honours) Botany Programme

(With Research/without Research)

SCIUG103

NEP-2020

With effect from June – 2024 (and thereafter)

FACULTY OF SCIENCE

Subject: BOTANY

B. Sc. Semesters: III and IV

Total Pages: 01 to 65

Submitted on

Date: 14th March 2024(Thursday)

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./KCG/NEP/2024-25/1368 Dt. 29/09/2023.

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B.Sc. Semester III Courses :: BOTANY ::

SEMESTER: THIRD	TYPES OF THE COURSES	PAPER NO.	PROGRAMME CODE	TITLE OF THE COURSE	CREDITS (T=TEACHING P=PRACTICAL)
	MAJOR THEORY	III	SCIUG103	MYCOLOGY AND PHYTOPATHOLOGY (SC23MJDSCBOT301)	4T
		IV		ARCHEGONIATE (SC23MJDSCBOT301A)	4T
	MAJOR PRACTICAL (GROUP A & B)	III		MYCOLOGY AND PHYTOPATHOLOGY (SC23PMJDSCBOT301)	2P
		IV		ARCHEGONIATE (SC23PMJDSCBOT301A)	2P
	MULTI/INTER DISCIPLINARY THEORY	III		MEDICINAL BOTANY (SC23MDCBOT303)	2T
	MULTI/INTER DISCIPLINARY PRACTICAL	III		MEDICINAL BOTANY (SC23PMDCBOT303)	2P
	ABILITY ENHANCEMENT THEORY	III		FROM POOL OF COURSE (Language) (SC23AECBOT304)	2T
	INDIAN KNOWLEDGE SYSTEM THEORY	II		INDIGENOUS MEDICINAL SYSTEM (SC23IKSBOT305)	2T
	SKILL ENHANCEMENT THEORY	III		MUSHROOM CULTIVATION (SC23SECBOT306)	2T

B.Sc. Semester IV Courses :: BOTANY ::

SEMESTER: FOURTH	TYPES OF THE COURSES	PAPER NO.	PROGRAMME CODE	TITLE (COURSE CODE)	CREDITS (T=TEACHING P=PRACTICA)
	MAJOR THEORY	V	SCIUG103	ANATOMY OF ANGIOSPERMS (SC23MJDSCBOT401)	4T
		VI		ECONOMIC BOTANY (SC23MJDSCBOT401A)	4T
	MAJOR PRACTICAL (GROUP A & B)	V		ANATOMY OF ANGIOSPERMS (SC23PMJDSCBOT401)	2P
		VI		ECONOMIC BOTANY (SC23PMJDSCBOT401A)	2P
	MINOR THEORY	III		APPLIED BOTANY (SC23MiDCBOT402)	2T
	MINOR PRACTICAL	III		APPLIED BOTANY (SC23PMiDCBOT402)	2P
	ABILITY ENHANCEMENT THEORY	IV		FROM POOL OF COURSE (Language) (SC23AECBOT404)	2T
	VALUE ADDED COURSE THEORY	II		FROM POOL OF COURSE (SC23VACBOT405)	2T FROM POOL OF COURSE
	SKILL ENHANCEMENT THEORY	IV		PLANT BREEDING (SC23SECBOT406)	2T

CONTENTS

Framed according to National Education Policy (NEP) - 2020

Under Choice Based Credit System-Semester-Grading System pattern

UG (B. Sc.) Programme in Botany

Semester-III and IV

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 sem. III & IV has been designed and decided to be implemented from the academic session from June 2024-25.

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.

PROGRAMME LEARNING OUTCOMES:

Learning Outcome Curriculum Framework (LOCF) aims to equip students with knowledge, skills, values, attitudes, leadership readiness/qualities and lifelong learning. The fundamental premise of LOCF is to specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. Besides this, students will attain various 21st century skills like critical thinking, problem solving, analytic reasoning, cognitive skills, self-directed learning etc.. A note on LOCF for undergraduate education is available on the UGC website www.ugc.ac.in. It can serve as guiding documents for all Universities undertaking the task of curriculum revision and adoption of outcome based approach.

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.

PO 7: Analytical ability: The students will be able to demonstrate the knowledge in understanding research and addressing practical problems. Application of various scientific methods to address different questions by formulating the hypothesis, data collection and critically analyze the data to decipher the degree to which their scientific work supports their hypothesis.

SALIENT FEATURES:

- B.Sc. (Honours) Botany in UG programme - **Semester III and IV** shall be offered from the Academic year, June **2024**.
- Botany subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2024-25.
- 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 two **Major (MJDSC) Compulsory** course (Theory) with **4 credits/major** and their practical with **4 credits**.
- One **Minor (MiDSC) Compulsory (sem. IV)** course and **Multi-Disciplinary Course (MDC) (sem. III)** (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 2** credit, **SEC 2** credit**, IKS (sem. III)** and **VAC (sem. IV) 2** credit course shall be offered.
- 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 4credits) 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

ATTENDANCE:

The attendance rules as per the norms of Hemchandracharya North Gujarat University, Patan.

To be able to appear for the SEE, a student must comply with the following conditions:

1. Should have at least 75% of attendance in all the courses put together.
2. Should have at least 70% of attendance in each course/subject.
3. Should not have any disciplinary proceedings pending against him/her.
4. Should have no pending due.

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. Open Book Reading 7. 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/Dissertatio	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% (50)	**SEE- 50% (50)**
Exam Pattern	**Marks**
Class Test (Best 2 out of 3)	15
Quiz (Best 3 out of 4)	15
Active Learning	05
Home Assignment	05
Class Assignment	05
Attendance	05
Continuous and Comprehensive Evaluation(CCE)	**50**
Semester-End Evaluation (SEE)	**50**

Model for Practical Courses	
CCE- 50% (50)	**SEE- 50% (50)**
Exam Pattern	**Marks**
Lab work assessment (Best 4 out of 5)	20
Viva voce/Lab quiz (Best 4 out of 5)	20
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	**50**
Semester-End Evaluation(SEE)	**50**

Model for Project/Self Model for Project/Self-study course-study/ Model for work experience course	
CCE- 50% (50)	**SEE- 50% (50)**
Exam Pattern	**Marks**
Project Evaluation (Best 3 out of 5)	30
Participation in discussion	10
Attendance	10
Continuous and Comprehensive Evaluation(CCE)	**50**
Semester-End Evaluation(SEE)	**50**

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 **36%** 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, Patan(Gujarat)***.

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.

$$\textbf{SGPA (Si)} = \sum \textbf{(Ci X Gi)} / \sum \textbf{Ci}$$

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.

$$\textbf{CGPA} = \sum \textbf{(Ci X Si)} / \sum \textbf{Ci}$$

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

SEMESTER: IV
SUMMARY OF THE PROGRAMME

SYLLABUS DURATION	SEMESTER PATTERN *I.E.*, SIX MONTHS (single major)
THEORY	
No. of Discipline Specific Major Core Courses (MJDSC)	***02/Semester***
Credits per Discipline Specific Major Core Course (MJDSC)	*04*
Total credits for Discipline Core Major Course (MJDSC)	***08/Semester***
Theory lectures per Discipline Major Core Course (MJDSC)	*04/week*
No. of Minor Disciplinary Courses (MiDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) & Value Added Course (VAC)	***01/Semester***
Credits per Minor Disciplinary Courses (MiDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) & Value Added Course (VAC)	*02*
Total credits for Minor Disciplinary Courses (MiDC), Ability Enhancement Courses(AEC), Skill Enhancement Courses (SEC) & Value Added Course (VAC)	***02/Semester***
Theory lectures per Minor Disciplinary Courses (MiDC), Ability Enhancement Courses(AEC) Skill Enhancement Courses (SEC) & Value Added Course (VAC)	*02 /week*
PRACTICAL	
No. of Practical courses *per Discipline Specific Major Core Courses (MJDSC)(GROUP A+GROUP B)*	***01 (in each semester)***
Credits per Practical course	***04(GROUP A:2+GROUP B:2)***
Total Credits of Practical course	*04/Semester*
Total Practical lectures	*08/week/ batch*
No. of Practical course (in Uni. Exam.)	***01****/Semester*
No. of Practical courses *per Discipline Specific Minor Disciplinary Courses (MiDC)*	***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	*As per approval of AC and Exam. Unit*

SEMESTER: IV

MAJOR DISCIPLINE SPECIFIC CORE COURSE:

PROGRAMME CODE: SCIUG103

SEM- IV: SC23MJDSCBOT401: ANATOMY OF ANGIOSPERMS

Programme specific Learning Outcomes:

On completion of the 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.

SEM- IV: SC23MJDSCBOT401A: ECONOMIC BOTANY

Programme specific Learning Outcomes:

On completion of the 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.

MINOR DISCIPLINE SPECIFIC CORE COURSE:

PROGRAMME CODE: SCIUG103

SEM- IV: SC23MiDSCBOT402: APPLIED BOTANY

Programme specific Learning Outcomes:

On completion of the course, the students will be able to:

- Understand core concepts of Economic Botany and ecosystems.
- 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- IV: SC23SECBOT406: PLANT BREEDING

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, PATAN

(Effective from June 2024-25 UNDER NEP-2020)

MAJOR DISCIPLINE SPECIFIC CORE COURSE (MJDSC) ***Programme Code: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***Credits***	***Lectures***	***THEORY***	
						CCE	***SEE***
Diploma Course	***B.Sc. IV***	***SC23MJDSCBOT401***	**ANATOMY OF ANGIOSPERMS**	**4**	**T=60hrs**	***50%***	***50%***
Course outcomes:	On completion of the 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. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.						
THEORY UNIT	***TOPIC***						***NO. OF LECTURES* (60hrs)**
Unit 1	***Anatomy:*** • 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.						**15**

Unit 2	***Anatomy:*** • Stomata: types, location, structure & function, classification (Metcalfe and Chalk). • Aleurone layer of **Maize**, Aleurone crystal of **Castor seed**, Hydathodes, Cavities, Cystolith and Laticifers. ***Ergastic substances:*** • Starch grains of **Potato** and **Wheat.**	**15**
Unit 3	***Meristems:*** • 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).	**15**
Unit 4	***Secondary growth:*** • 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.	**15**

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.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2024-25 UNDER NEP-2020)

MAJOR DISCIPLINE SPECIFIC CORE COURSE (MJDSC) ***Programme Code: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***Credits***	***Lectures***	***THEORY***	
						CCE	***SEE***
Diploma Course	***B.Sc. IV***	***SC23MJ DSCBOT 401A***	**ECONOMIC BOTANY**	**4**	**T=60hrs**	***50%***	***50%***
Course outcomes:	On completion of the 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. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.						
THEORY UNIT	***TOPIC***					***NO. OF LECTURES*** **(45hrs)**	
Unit 1	***Plant Resources-1:*** • 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.					**15**	
Unit 2	***Plant Resources- 2:*** • Origin, morphology, processing and uses of **Wheat, Rice** and **Bajara**. • Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Chick pea** and **Pigeon pea**.					**15**	

Unit 3	***Plant Resources- 2*** • 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. • Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Groundnut.**	**15**
Unit 4	***Plant Resources- 3*** • Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **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, Cotton** and **Jute**.	**15**

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.

DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BOTANY

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

MAJOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (PMJDSC) *Programme Code: SCIUG103*						
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***CCE***	***SEE***
Diploma Course	***B.Sc. IV***	***SC23PMJDSCBOT 401***	**ANATOMY OF ANGIOSPERMS, ECONOMIC BOTANY**	**4 (120 hrs)**	***50%***	***50%***
Course outcomes:	After the completion of the course the students will be able: • Develop an understanding of concepts and fundamentals of plant anatomy examine the internal anatomy of plant systems and organs. • Analyze the composition of different parts of plants and their relationships. • Understand core concepts of Economic Botany and relate with environment, populations, communities, and ecosystems. • 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. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.					

PRACTICALS	***NO. OF LECTURES*** **(120 hrs)**
GROUP A	
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 (***Nephrolepis***), Cavities, Cystolith (***Ficus* leaf**). 3. Apical meristem of root and shoot. 4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings (**Sunflower stem**). 5. Phloem: Sieve tubes-sieve plates; companion cells (***Cucurbita* stem**).	**60**

6. Epidermal system: stomata types (Dicot & Monocot); trichomes: non-glandular (***Abutilon*/Cotton**), glandular (***Ocimum***), Periderm (PS) & Lenticels (PS). 7. Root: Secondary growth (**Sunflower root & aerial root of *Tinospora***). 8. Stem: secondary growth (**Sunflower & *Salvadora* stem**).	
GROUP B	
Write Scientific name, Family, Useful part, Chemical constitutes, economic important and draw labelled diagram of plant: 1. **Cereals:** • **Wheat, Rice** and **Bajara** (habit sketch, 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**, • **Fennel** and • **Clove**. 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).	**60**

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.
6. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
7. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.
9. Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2024-25 UNDER NEP-2020)

B. SC. :: BOTANY PRACTICAL(MAJOR) :: SEMESTER-IV

Programme Code: SCIUG103

ANATOMY OF ANGIOSPERMS, ECONOMIC BOTANY

SC23PMJDSCBOT 401 & SC23PMJDSCBOT 401A

(GROUP A & GROUP B)

Date: **Place:**

Time: 5 Hrs **Total Marks: 50**

Instructions: Strictly follow the instructions given by examiner(s).

(GROUP A)

1. Study of secondary growth of given specimen **A**. Draw the labelled diagram of it and show your slide to the examiner. **06**
2. Study of Ergastic substances (Aleurone layer of **Maize**, Aleurone crystal of **Castor seed**), Hydathodes(***Nephrolepis***), Cavities, Cystolith(***Ficus* leaf**) 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:** Permanent slide **(**Apical meristem of root and shoot**)**. (5 minutes)

   II) Specimen – **D**: permanent slide **(**Epidermal system**)**. (5 minutes)

4. a. *Viva-voce* **03**

   b. Journal **04**

(GROUP B)

1. Identify and write local name, botanical name, family, useful part, economic important. **06**

   - Specimen A & B

2. Write Scientific name, Family, Useful part, Chemical constitutes, economic important and draw labelled diagram of plant:

   - Specimen C & D **06**

3. Whole mount of fiber and test for cellulose/whole mount of seed to show lint and fuzz/whole mount of fiber and test for cellulose. **06**

4. a. *Viva-voce* **03**

   b. Journal **04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2024-25 UNDER NEP-2020)

MINOR DISCIPLINE SPECIFIC CORE COURSE (MiDSC) ***Programme Code: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***Credits***	***Lectures***	***THEORY***	
						CCE	***SEE***
Diploma Course	***B.Sc. IV***	***SC23MiDSCBOT402***	**APPLIED BOTANY**	**2**	**T=30hrs**	***50%***	***50%***
Course outcomes:	On completion of the 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. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.						
THEORY UNIT	***TOPIC***						***NO. OF LECTURES*** **(45hrs)**
Unit 1	• Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Carrot** and **Sugar beet**. • Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Cabbage and Onion**. • Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Elephant yam** and **Sweet potato**.						**15**

Unit 2	• Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Para-rubber** and **Fennel**. • Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Ashwagandha** and **Sarpgandha.** • Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of **Isabgol** and Tannin yielding plant- ***Acacia***.	**15**

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.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

(Effective from June 2024-25 UNDER NEP-2020)

<table>
<tr><td colspan="7">MINOR DISCIPLINE SPECIFIC CORE COURSE -PRACTICAL (PMiDSC)
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 rowspan="2">Credits</td><td rowspan="2">Lectures</td><td colspan="2">PRACTICAL</td></tr>
<tr><td>CCE</td><td>SEE</td></tr>
<tr><td>Diploma Course</td><td>B.Sc. IV</td><td>SC23PMiDSCBOT 402</td><td>APPLIED BOTANY</td><td>2</td><td>P=60hrs</td><td>50%</td><td>50%</td></tr>
<tr><td>Course outcomes:</td><td colspan="6">On completion of the 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.
Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.</td></tr>
<tr><td>THEORY UNIT</td><td colspan="5">TOPIC</td><td>NO. OF LECTURES (60hrs)</td></tr>
<tr><td>PRACTICALS</td><td colspan="5">Introduction, Origin, cultivation, morphology, family, scientific name, useful parts, chemical constituents and uses of:
Carrot and Sugar beet.
Cabbage and Onion.
Elephant yam and Sweet potato.
Para-rubber and Fennel.
Ashwagandha and Sarpgandha.
Isabgol and Tannin yielding plant- Acacia.</td><td>60</td></tr>
</table>

Suggested Readings

4. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
5. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
6. Chrispeels, M.J. and Sadava, D.E. 1994 Plants, Genes and Agriculture. Jones & Bartlett Publishers.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

(Effective from June 2024-25 UNDER NEP-2020)

B. SC. :: BOTANY PRACTICAL(MINOR) :: SEMESTER-IV

Programme Code: SCIUG103

APPLIED BOTANY

SC23PMiDSCBOT 402

Date: **Place:**

Time: 5 Hrs **Total Marks: 25**

Instructions: Strictly follow the instructions given by examiner(s).

1. Scientific name, family, useful parts, chemical constituents and uses of: **09**
   - **Specimen A**
   - **Specimen B**
   - **Specimen C**

2. Scientific name, family, useful parts, chemical constituents and uses of: **09**
   - **Specimen D**
   - **Specimen E**
   - **Specimen F**

4. a. *Viva-voce* **03**

   b. Journal **04**

SKILL ENHANCEMENT COURSE (SEC) ***Programme Code: SCIUG103***							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***Credits***	***Lectures***	***THEORY***	
						CCE	***SEE***
Diploma Course	***B.Sc. IV***	***SC23SEC BOT406***	**PLANT BREEDING**	**2**	**T=30hrs**	***50%***	***50%***
Course outcomes:	On completion of the course, the students will be able to: • Understand the fundamental concepts of pharmacognosy. • Develop the skills of alkaloids extraction. • Examine the alkaloids. • Evaluate the process of screening alkaloids. **Pedagogy:** Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.						
THEORY UNIT	***TOPIC***						***NO. OF LECTURES* (30hrs)**
Unit 1	***Plant Breeding:*** • 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.						**15**
Unit 2	***Inbreeding depression and heterosis:*** • 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.						**15**

Suggested Readings

1. Singh, B.D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.
2. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH. 2ndedition.
3. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc Programme (CBCS - Semester - Grading Pattern)
(Effective from June 2024-25 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. – III & IV)

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-301,301A,401,401A**	
Name of Paper :		
Total Hours : 02:30 Hrs	**Total Marks : 50**	
Instructions: (1) This question paper contains four questions. (2) All questions are compulsory. (3) Figures at right side indicate the marks of question. (4) Illustrate your answer with labelled diagram.		
Que.1 (A)	**Describe in detail:(any one)** (1) (2)	**08**
(B)	**Write short note:(any one)** (1) (2)	**04**
Que.2 (A)	**Describe in detail:(any one)** (1) (2)	**09**
(B)	**Write short note:(any one)** (1) (2)	**04**
Que.3 (A)	**Describe in detail:(any one)** (1) (2)	**08**
(B)	**Write short note:(any one)** (1) (2)	**04**
Que.4(A)	**Describe in detail:(any one)** (1) (2)	**09**
(B)	**Write short note:(any one)** (1) (2)	**04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B.Sc Programme (CBCS - Semester - Grading Pattern)
(Effective from June 2024-25 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. – III & IV)

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:** **MDCBOT-303** **MiDSCBOT-402** **AEC -304 & 404** **IKS- 305 & VAC-405** **SECBOT- 306 & 406**
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)
14. Practical exam (https://ngu.ac.in/Admin/CircularPDF/PARIXA-KHANGI-EMAIL-2024.pdf)
15. Common credit structure

    (https://ngu.ac.in/Admin/CircularPDF/Credit%20Framework%20GR%20Gujarati%2011072023.pdf)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State

University PATAN-

384265

Faculty of Science

B. Sc. Zoology

Syllabus/ scheme

Semester – 3 to 4

With effect

from June-

2024

Date: 11/03/2024 Total page: 38

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN	
B. Sc. (Zoology) Syllabus 2024 (according to NEP-2020)	
Document code	**Syllabus ZL- 2024**
Name of faculty	**Science**
Faculty code	**SCI**
Programme name	**B. Sc. ZOOLOGY**
Programme code	**SCIUG104**
Effective from	**June-2024**

The proposed new structure for B. Sc. course is based on NEP-2020 which is in force June-2024.

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 (CCE)

1. For CCE 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 CCE 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 III (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 ZOO301	Diversity of chordates- I	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDSC ZOO301A	Ecology, Environmental Pollution and Climate Change	4	50	50	100	4	2.5
Multi Disciplinary Course	SC23MDC ZOO303	Introduction to Ecology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23 PMJDSC ZOO301	Diversity of chordates- I Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
	SC23 PMJDSC ZOO301A	Ecology, Environmental Pollution and Climate Change Practical Part B	4	25	25			More than 3
Multi Disciplinary Course Practical Paper	SC23PMDC ZOO303	Introduction to Ecology practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO304	English	2	25	25	50	2	2
Indian Knowledge System II Course	SC23IKSZ OO305	IKS course basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO306	Introduction to Poultry Science	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

B.Sc. Semester IV (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 ZOO401	Diversity of chordates- II	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDSC ZOO401A	Economic Zoology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC ZOO402	Industrial Zoology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23PMJDSC ZOO401	Diversity of chordates- II Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
	SC23MJDSC ZOO401A	Economic Zoology Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC ZOO402	Industrial Zoology practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO404	English	2	25	25	50	2	2
Value added courses	SC23VAC ZOO405	Value added course basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO406	Fish Aquarium Management	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

Semester IV

B. Sc. Semester IV (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 ZOO401	Diversity of chordates- II	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDSC ZOO401A	Economic Zoology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDSC ZOO402	Industrial Zoology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23PMJDSC ZOO401	Diversity of chordates- II Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
	SC23MJDSC ZOO401A	Economic Zoology Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDSC ZOO402	Industrial Zoology practical	4	25	25	50	2	More than 3
Ability Enhancement Course	SC23AEC ZOO404	English	2	25	25	50	2	2
Value added courses	SC23VAC ZOO405	Value added course basket	2	25	25	50	2	2
Skill Enhancement Course	SC23SEC ZOO406	Fish Aquarium Management	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER IV
PROGRAM CODE: SCIUG104
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCZOO401

DIVERSITY OF CHORDATES- II

EFFECTIVE FROM JUNE 2024-25 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:

After thorough understanding of the content student will be able to explain:

1. General characters and classification of class Reptilia up to orders.
2. General characters and classification of class Aves up to orders.
3. General characters and classification of class Mammalia up to orders.

Sr. No			Credit	Hr
1	Unit-1	● General characters and classification of class reptilia. ● Origin, evolution and adaptive radiation in reptiles. ● Type study: *Calotis versicolor*- The Garden Lizard habit and habitat and external features ● Systems of *Calotis versicolor*: digestive system, respiration, blood vascular, nervous and urinogenital system).	1	15
2	Unit-2	● General characteristics and classification of class aves ● Type study: *Columba livia*- The common rock pigeon, habit and habitat, external features ● Systems of *Columba livia*- The common rock pigeon digestive system, respiration, blood vascular, nervous and Urinogenital system). ● Adaptation of beak and feet in aves	1	15

3	**Unit-3**	● General characteristics and classification of class Mammalia ● Origin and adaptive radiation in mammals ● Type study: *Ratttus rattus*- The Rat, habit and habitat, external features ● Systems of *Ratttus rattus*- digestive system, respiration, blood vascular, nervous and urinogenital system.	**1**	**15**
4	**Unit-4**	● Introduction to venomous and non- venomous snakes, poison apparatus and biting mechanism in snakes, symptoms and cure of snake bite. ● Origin, mechanism, mode and adaptation of bird flight. ● Migration and economic importance of birds ● Adaptations in terrestrial, aquatic and flying mammals.	**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 IV
PROGRAM CODE: SCIUG104
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCZOO401A

ECONOMIC ZOOLOGY

EFFECTIVE FROM JUNE 2024-25 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:

After thorough understanding of the content students will:

1. Develop understanding on insect pest and their management.
2. Develop understanding on economic benefits of terrestrial animals.
3. Develop understanding on economic benefits of aquatic animals.

Sr. No			Credit	Hr
1	Unit-1	• Insect pest of some economically important crops: Pest of sugarcane: *Pyrilla perpusilla* (sugarcane leaf hopper), *Chilo infuscatellus snellen* (sugarcane shoot borer); Pest of paddy: *Leptocorisa acuta* (Rice bug), *Heiroglyphus* (Kharif grasshopper); Pest of pulse: *Helicoyerpa armigera* (grampod borer), *Agrotis ypsilon* (Gram cutworm); Pest of vegetables: *Raphidopalpa foveicollis* (red pumpkin beetle), *Pieris brassicae* (cabbage butterfly); Pest of fruits: *Galerucella birmanica* (Singhara beetle), *Idiocerus atkinsoni* (Mango leaf-hopper). • Household pest: Insects affecting human health: human louse, bed bugs, fleas; Insects damaging food products: Rice weevil, wheat weevil, *Tribolium castaneum* (red floor beetle); Insects damaging other household goods: termites, silver fish. • Mites and Ticks and their control: Introduction and	1	15

		difference between ticks and mites; Mites: *Sarcoptes scabiei* (Mangemite); *Dermanyssus gallinae* (Chicken mite); *Psoroptes equiovis* (Sheep scabe mite); *Eutombicula alfreddugesi* (Chiggers); Ticks: *Boophilus micoplus* (Cattle tick); *Argas persicus oken* (Fowl tick). ● Insect pest management: Introduction, natural control, applied control, integrated pest management.		
2	**Unit-2**	● Seri culture: Introduction, Types of silk, species of silk worm, mulberry silkworm, Sericulture industry, rearing of silkworm. ● Diseases of silkworm, economic importance of silk, status of sericulture in India. ● Lac culture: Introduction, distribution, life history, host plants, cultivation of Lac, recent plan for lac culture. ● Processing of Lac Industry, enemies of lac cultivation, lac industries in India, Economic importance.	**1**	**15**
3	**Unit-3**	● Fish culture: Introduction, indigenous and exotic fishes, breeding ponds, fish seed, hatching pit, nursery pond, rearing pond, stocking pond, harvesting, fishing methods, fish preservation, composite fish farming. ● By products of fishing industry. ● Pearl culture: History, pearl producing molluscs and sites in India, natural and artificial pearl formation, composition of pearl. ● Prawn fisheries: types of prawn fisheries, species of prawns, culture of fresh and marine prawns, preparation of prawn farm, methods of prawn fishing, preservation and processing of prawn, export of prawn.	**1**	**15**
4	**Unit-4**	● Piggery: Introduction, estrous cycle and fertility of pigs, artificial fertilization, milk production and growth, products of piggery. ● Dairy industry: Introduction, breeds of dairy animals (Cattle and non-cattle), feed of adults and youngs, diseases, milk and milk products. ● Leather industry: Animals of leather industry, processing of skin, ● Wool industry: Types of wool in India, physical and chemical properties of wool, removal of wool from sheep.	**1**	**15**

Reference:

1. Economic Zoology- Biostatistics and Animal behaviour – S.Mathur, Rastogi Publicatons. 19.
2. Economic Zoology- Shukla G.S. &Upadhyay V.B., Rastogi Publications. 20.
3. A handbook on Economic Zoology, S. Chand & Co

Further Reading:

4. Hickman C. P., et al. (2006) Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition
5. Jordan E. L. and Verma P. S. (1993) Invertebrate Zoology, S.Chand publishing. Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER IV
PROGRAM CODE: SCIUG104
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE:
SC23PMJDSCZOO401 & SC23PMJDSCZOO401A
DIVERSITY OF CHORDATES- II PRACTICAL PART A
ECONOMIC ZOOLOGY PRACTICAL PART B
EFFECTIVE FROM JUNE 2024-25 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**	

SC23PMJDSCZOO401: DIVERSITY OF CHORDATES- II PRACTICAL PART A

List of Practicals

1. Study of classification of Class reptilia (up to Order) using laboratory specimens, models, slides, charts.
2. Study of classification of class Aves (up to Order) using laboratory specimens, models, slides, charts.
3. Study of classification of class Mammalia up to orders using laboratory specimens, models, slides, charts.
4. Study of Digestive system of *Calotis versicolor* using models, slides and charts.
5. Study of Circulatory system of *Calotis versicolor* using models, slides and charts.
6. Study of Nervous system of *Calotis versicolor* using models, slides and charts.
7. Study of Urinogenital system of *Calotis versicolor* using models, slides and charts.
8. Study of Digestive system of *Columba livia* using models, slides and charts.
9. Study of Circulatory system of *Columba livia* using models, slides and charts.
10. Study of Nervous system of *Columba livia* using models, slides and charts.
11. Study of Urinogenital system of *Columba livia* using models, slides and charts.
12. Study of Digestive system of *Ratttus rattus* using models, slides and charts.
13. Study of Circulatory system of *Ratttus rattus* using models, slides and charts.
14. Study of Nervous system of *Ratttus rattus* using models, slides and charts.
15. Study of Urinogenital system of *Ratttus rattus* using models, slides and charts
16. Study of Air sac and gizzard of *Columba livia* using models, slides and charts (mounting).
17. Study of Pectin and cloacae of *Calotis versicolor* using models, slides and charts (mounting).
18. Study of hair and teeth of *Ratttus rattus* using models, slides and charts (mounting).
19. Study of Adaptations in terrestrial, aquatic and flying mammals.
20. Study of venomous and non-venomous snakes using models, slides and charts.

SC23PMJDSCZOO401A: ECONOMIC ZOOLOGY PRACTICAL PART B

List of Practicals

1. Study of insect pest of crop.
2. Study of insect pest of pulses.
3. Study of vegetable pests and their control.
4. Study of fruit pests and their control.
5. Study of insect pest damaging food products and their control.
6. Study of parasitic mites and ticks.
7. Study various methods of pest control.
8. Study of life cycle of silk worms and production of different type of silk.
9. Study of life cycle of lac insect, lac production and uses of lac.
10. Study of common culturable fishes, fish feed and fish culture techniques.
11. Study of fish by products and their economic importance.
12. Study of pearl farming and the process of pearl formation.
13. Study of common culturable prawns and culture techniques.
14. Study of different cattle breeds and their economic importance.
15. Study of different non-cattle breeds and their economic importance.
16. Study of wool producing animals and the properties of their wool.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER IV
PROGRAM CODE: SCIUG104
MINOR DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCZOO402

INDUSTRIAL ZOOLOGY

EFFECTIVE FROM JUNE 2024-25 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 students will:

1. Develop understanding on economic benefits of animals.
2. Develop understanding on economic benefits of animal by product.

Sr. No			Credit	Hr
1	Unit-1	● Seri culture: Introduction, Types of silk, species of silk worm, mulberry silkworm, Sericulture industry, rearing of silkworm, Diseases of silkworm, economic importance of silk, status of sericulture in India. ● Lac culture: Introduction, distribution, life history, host plants, cultivation of Lac, recent plan for lac culture. ● Processing of Lac Industry, enemies of lac cultivation, lac industries in India, Economic importance. ●Pearl culture: History, pearl producing molluscs and sites in India, natural and artificial pearl formation, composition of pearl.	1	15

2	**Unit-2**	● Piggery: Introduction, oestrous cycle and fertility of pigs, artificial fertilization, milk production and growth, products of piggery. ● Dairy industry: Introduction, breeds of dairy animals, feed of adults and youngs, diseases, milk and milk products ● Leather industry: Animals of leather industry, processing of skin, ● Wool industry: Types of wool in India, physical and chemical properties of wool, removal of wool from sheep	**1**	**15**

Reference:

1. Economic Zoology- Biostatistics and Animal behaviour – S.Mathur, RastogiPublicatons. 19.
2. Economic Zoology- Shukla G.S. &Upadhyay V.B., Rastogi Publications. 20.
3. A handbook on Economic Zoology, S. Chand & Co

Further Reading:

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.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER IV
PROGRAM CODE: SCIUG104
PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE: SC23PMIDSCZOO402

INDUSTRIAL ZOOLOGY

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

List of practical

1. Study of life cycle of silk worm.
2. Study of different species of silk worm.
3. Study of different diseases of silk worm.
4. Study of life cycle of lac insect, lac production and uses of lac.
5. Study of estrous cycle of pig.
6. Study of pig rearing and different products of piggery.
7. Study of pearl farming and process of pearl formation
8. Study of pearl producing oyster species.
9. Study of milk products of dairy industry.
10. Study of diseases of dairy animals.
11. Study of different cattle breeds and their economic importance.
12. Study of different non-cattle breeds and their economic importance.
13. Study of wool producing animals and the properties of their wool.
14. Study of different types of leather, their origin and properties.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER IV
PROGRAM CODE: SCIUG104
SKILL ENHANCEMENT COURSE CODE: SC23SECZOO406

FISH AQUARIUM MANAGEMENT

EFFECTIVE FROM JUNE 2024-25 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:

After thorough understanding of the content student will be able to explain:

1. Morphology and importance of ornamental fishes.
2. Identification and importance of aquarium fishes in daily life styles.

Sr. No			**Credit**	**Hr**
1	**Unit-1**	● Types of fish aquarium: Freshwater and Marine Aquaria. ● Equipments and requirements for home aquariums: Aerators and Filters – Hand net and other equipment. ● Water quality requirements – Temperature control and Lighting. ● Types and selection of tank: tank setting and position, Aquascaping, precautions for an ideal aquarium.	**1**	**15**
2	**Unit-2**	● Aquarium fishes: Charecters of aquatic fishes, community aquarium fishes, ornamental fishes, Nutritional requirements of aquarium fishes. ● Aquarium plants: Introduction to aquarium plants, Importance of aquarium plants, Types of aquarium plants, arrangement of aquarium plants. ● Reproductive biology of aquarium fish		

		● Aquarium fish diseases: Types of Aquarium fish diseases, (Bacterial disease- Dropsy, Fungal disease, Branchiomycosis, Viral- Viral hemorrhagic septicemia (VHS), Parasitic- velvet disease) ● Causes, symptoms and treatment of Aquarium fish diseases.		

Reference:

1. Guide to tropical fish keeping, 1967, Braymer, J.H.P.ILiffe.
2. Tropical Marine aquaria, 1974. Cox, J.F.Hamlyn.
3. Tropical Fish: Setting up and maintaining fresh water and Marine aquaria,1972. Dussa Octopus BookLtd.
4. Aquarium systems, 1981. Hawkins, A.S.(Ed.) Academicpress.
5. Living Aquarium, 1981. Hunnam, P. WardLock.
6. Aquarium Fishes and Plants, 1971, Rataj, K. and R. Zukal –Hamlyn.

Further reading:

7. Ornamental Fish for Garden and Home Aquariums, 1956, R and C.P Home Aquariums.
8. Sea Water Aquariums, 1979.Spotte, S. JohnWiley.
9. Collins Guide to Aquarium Fishes and Plants, 1969.Schiotz, A.Collins.
10. Complete Aquarium, 1963.Vogt,D. and H. WermuthThames

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. ZOOLOGY SEMESTER IV
PROGRAM CODE: SCIUG104
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE:
SC23PMJDSCZOO401 & SC23PMJDSCZOO401A

DIVERSITY OF CHORDATES- II PRACTICAL PART A
ECONOMIC ZOOLOGY PRACTICAL PART B

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 50**

DIVERSITY OF CHORDATES- II PRACTICAL PART A

Q 1		Draw and label the diagram of given system of *Calotis versicolor /Columba livia* and describe location and functions of different organs in brief.	**06**
Q 2		Draw and label the diagram of given system of *Ratttus rattu*s and describe location and functions of different organs in brief.	**06**
Q 3		Do as directed: 1. Identify and classify the specimen up to order and describe its morphological characters. (Reptilian, Aves, Mammalia) 2. Identify and describe (Venomous and non-venomous snakes). **3.** Identify and describe its adaptations. (Terrestrial, aquatic and flying mammals)	**06**
Q 4	**a**	Viva-voce	**03**
	b	Journal	**04**

ECONOMIC ZOOLOGY PRACTICAL PART B

Q 1		Identify & Draw and label the diagram of life cycle of silk worm/ lac insect.	**06**
Q 2		Study of different cattle & non cattle breeds and their economic importance.	**06**
Q3		Do as directed 1. Identify and describe. (Pest of crop/ pulses/ vegetable/ fruit/ household pest) 2. Identify and describe. (culturable fishes/ prawns/ fish by products/pearl culture) 3. Identify and describe. (parasitic mites and ticks/ methods of pest control/ wool producing animals)	**06**
Q 4	**a**	Viva-voce	**03**
	b	Journal	**04**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
COURSE NAME B. SC. ZOOLOGY SEMESTER IV
PROGRAM CODE: SCIUG104
PRACTICAL MINOR SPECIFIC COURSE CODE:
SC23PMIDSC ZOO402

INDUSTRIAL ZOOLOGY

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 25**

Q 1		Identify & Draw and label the diagram of life cycle of silk worms/ lac insect. **OR** Study of different cattle & non cattle breeds and their economic importance.	**10**
Q 2		Do as directed 1.Identify and describe. (Species/ diseases of silk worm). 2.Identify and describe. (Estrous cycle/ products of piggery) 3.Identify the specimen describe its details (pearl producing oyster species) 4.Identify the specimen describe its details (disease of dairy animals/ milk products) 5.Identify the specimen describe its details. (types of leather/ wool producing animals).	**10**
Q 3	**a**	Viva-voce	**03**
	b	Journal	**02**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

B. Sc. Microbiology

Syllabus/ scheme

Semester – 3 to 4

With effect from

June-2024

Date: 19/03/2024 Total page: 35

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN	
B. Sc. (Microbiology) Syllabus 2024 (according to NEP-2020)	
Document code	**Syllabus MIC- 2024**
Name of faculty	**Science**
Faculty code	**SCI**
Programme name	**B. Sc. MICROBIOLOGY**
Programme code	**SCIUG105**
Effective from	**June-2024**

The proposed new structure for B. Sc. course is based on NEP-2020 which is in force June-2024.

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 (CCE)

1. For CCE 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 CCE 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 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 studentsfor self-employment in applied branches of Microbiology.
5. To inculcate the spirit of microbial 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 organization of microbial world, physiology, immunology, bioprospecting and importance of microbes in various biogeochemical cycles and for overall development.
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 Fermentation technology, Food microbiology, Environmental microbiology, Microbial biotechnology, Agriculture, 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 as academician in different institutes.
6. The syllabus has been designed in such a way that it will give good experience to thestudent to work under pressure.

B.Sc. Semester IV (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDS CMIC401	Molecular Biology and Genetics	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDS CMIC401A	Industrial Microbiology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDS CMIC402	Food and Dairy Microbiology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23PMJD SCMIC401	Molecular Biology and Genetics Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
	SC23MJDS CMIC401A	Industrial Microbiology Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDS CMIC402	Food and Dairy Microbiology practical	4	25	25	50	2	More than 3
Ability Enhancement Course		AEC Basket	2	25	25	50	2	2
Skill Enhancement Course		SEC Basket	2	25	25	50	2	2
Value added courses		IKS course Basket	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

Semester IV

B.Sc. Semester IV (Microbiology)

Course	Course code	Paper title	Teaching hours per week	CCE	SEE	Total marks	Credit points	Exam duration (Hours)
Major Discipline Specific core course	SC23MJDS CMIC401	Molecular Biology and Genetics	4	50	50	100	4	2.5
Major Discipline Specific core course	SC23MJDS CMIC401A	Industrial Microbiology	4	50	50	100	4	2.5
Minor Discipline Specific core course	SC23MIDS CMIC402	Food and Dairy Microbiology	2	25	25	50	2	2
Major Discipline Specific core course Practical Paper	SC23PMJD SCMIC401	Molecular Biology and Genetics Practical Part A	4	25	25	50 (Part A) + 50 (Part B) = 100	2 (Part A) + 2 (Part B) = 4	More than 3
	SC23MJDS CMIC401A	Industrial Microbiology Practical Part B	4	25	25			More than 3
Minor Discipline Specific core course Practical Paper	SC23PMIDS CMIC402	Food and Dairy Microbiology practical	4	25	25	50	2	More than 3
Ability Enhancement Course		AEC Basket	2	25	25	50	2	2
Skill Enhancement Course		SEC Basket	2	25	25	50	2	2
Value added courses		IKS course Basket	2	25	25	50	2	2
Total			**30**	**275**	**275**	**550**	**22**	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER IV
PROGRAM CODE: SCIUG105
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCMIC401

MOLECULAR BIOLOGY AND GENETICS

Total Credits- 04 (04Period/Week)	**Theory**	**External-50 Marks**
		Internal- 50 Marks

OBJECTIVE:
This syllabus is fruitful in the terms of basic and advance knowledge of Genetics with various molecular biological concepts with perspective of theory and practical approaches.

UNIT 1 : **Genetic material and its structure**

- ***Nature of Genetic material***: Understanding of terms: Chromosome, Nucleoid, Plasmid, Genome, Genetic material, Gene, Genotype, Phenotype, Replicon
- Experimental proof for DNA as genetic material: Work of Griffith; Avery, McCarty and MacLeod; Hershey and Chase
- **Structure of DNA**
  The elucidation of DNA structure, Features of Watson-Crick's model of DNA, types of DNA,
- **Structure of RNA**
  Structure and types of RNA, functions of RNA, catalytic RNA

UNIT 2: Replication of DNA

- Semi conservative nature, Meselson and Stahl's experiment, Molecular mechanism: Strand separation,
- Synthesis of RNA primer, Formation of leading strand and lagging strands,
- Removal of primer, Joining of Okazaki Fragments, Proofreading activity of DNA polymerase
- Patterns of DNA replication: Cairn's (Ø) model and Rolling Circle, Mechanism (σ model)

UNIT 3: Mutation and Genetic recombination

- Mutations – spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions.
- Mutagens - Physical and Chemical mutagens.
- Outlines of DNA damage and repair mechanisms.
- Genetic recombination in bacteria – Conjugation, Transformation and Transduction

UNIT 4: Gene and its regulation

- Concept of gene – Muton, Recon and Cistron. One gene one enzyme and one gene one polypeptide hypotheses, Genetic code.
- Types of genes – structural, constitutive, regulatory
- Protein synthesis – Transcription and translation.
- Regulation of gene expression in bacteria – *lac* operon.

Outcomes:

- ✓ Understand important definitions of Genome, Gene, Genotype, Phenotype characteristics. Various scientific experiments proved by scientist in the old era. Understand DNA structure and replication model.
- ✓ Students will understand gene expression pattern through transcription and translation. Important parameters of Gene regulation through the Lac operon and Tryptophan operon system which help to understand basic mechanisms.
- ✓ Through the mutation we can differentiate the wild type and mutant type characteristics of individual organisms through their types of mutation. Understand how the cells have multiple mechanisms for correcting mispaired and damaged DNA.
- ✓ Through the content, we can create additional genetic variability through conjugation, transformation and transduction experiments.

References

1. Crueger, W. and Crueger, A. (2000). Biotechnology: A Text Book of Industrial Microbiology, PrenticeHall of India Pvt. Ltd., New Delhi.
2. Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
3. Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
4. Glazer, A.N. and Nikaido, H. (1995). Microbial Biotechnology – Fundamentals of Applied Microbiology, W.H. Freeman and company, New York.
5. Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER IVPROGRAM CODE: SCIUG105
MAJOR DISCPLINE SPECIFIC COURSE CODE: SC23MJDSCMIC401A

INDUSTRIAL MICROBIOLOGY

Total Credits- 04 (04Period/Week)	**Theory**	**External-50 Marks**
		Internal- 50 Marks

UNIT 1: **Introduction to industrial microbiology**,

- Isolation, primary and secondary screening, preservation (principle, methods and quality control),
- Maintenance and improvement of industrially important organisms.
- Strain improvement Strategies, Selection of induced mutants, Selection of recombinants, Strain improvement for modifications of properties other than yield.

UNIT 2: Raw materials for fermentation processes

- Molasses, corn-steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates,
- Medium optimization**,** Principles of media formulation. Media ingredients: Water, carbon sources, nitrogen sources, minerals, growth factors, buffers, chelators, precursors, inducers, inhibitors, antifoam agents.
- Media sterilization using high pressure steam: Principle, batch and continuous sterilization process. - Sterilization of media using filtration: Principle, types of filters.
- Inoculum development: General principles for development of seed culture for bacterial, yeast and fungal processes.

UNIT 3: Types of fermentation processes:

- Solid-state and liquid-state (stationary and submerged) fermentations. Batch, fed-batch (eg. baker's yeast) and continuous fermentations.
- Fermenter Design: Components of a typical bio-reactor, Types of bioreactors, Laboratory, pilot- scale and production fermenters, constantly stirred tank and air-lift fermenters.
- Measurement and control of fermentation parameters: pH, temperature, dissolved oxygen, foaming and aeration

UNIT 4: Downstream processing:

- Bioseparation: filtration, centrifugation, sedimentation, flocculation, celldisruption, liquid-liquid extraction.
- Purification by chromatographic techniques, reverse osmosis and ultrafiltration, drying, crystallization,
- Storage and packaging.
- Economics in Fermentation technology.

Outcomes:

- ✓ Students will know about fundamental aspects fermentation technology
- ✓ Students will learn the basics of different approaches for the production and purification of industrially important products

References

1. Stanbury PF, Whitaker A and Hall SJ. Principles of Fermentation Technology, Butterworth
2. Heinemann and Elsevier. 2 Waites, MJ and Morgan NL. Industrial Microbiology: An Introduction, Blackwell Science
3. Crueger W andCrueger A. Biotechnology: A Textbook of Industrial Microbiology, Panima Publishing Corporation, New Delhi, India
4. Mansi EMTEL, Bryle CFA. Fermentation Microbiology and Biotechnology, Taylor & Francis Ltd., UK.
5. Casida LE, Jr.Industrial Microbiology, Wiley Eastern Ltd, New Delhi, India.
6. Patel AH. Industrial Microbiology. Macmillan India Limited
7. Okafor N. Modern Industrial Microbiology and Biotechnology. Bios Scientific
8. Principles Of Fermentation Technology By P F Stanbury Dr. A Whitaker
9. Comprehensive Biotechnology: Murray Moo Young
10. Methods in Industrial Microbiology: Sikyta

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER IV
PROGRAM CODE: SCIUG105
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE:SC23PMJDSCMIC401 & SC23PMJDSCMIC401A
MOLECULAR BIOLOGY AND GENETICS PRACTICAL PART A
INDUSTRIAL MICROBIOLOGY PRACTICAL 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**	

SC23PMJDSCMIC401: MOLECULAR BIOLOGY AND GENETICS PRACTICAL PART A

List of Practical

1. Study of different types of DNA and RNA using micrographs and model / schematic representations
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Isolation of genomic DNA from *E. coli*
4. Estimation of DNA using UV spectrophotometer.
5. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
6. Induction of mutations in bacteria by UV light.
7. Instrumentation in molecular biology – Ultra centrifuge, Transilluminator, PCR
8. Study of chemical mutagen (PFMS) induced mutation in bacteria
9. Isolation of pigment less mutant of *Serratia marcescens* using UV radiations as mutagen.
10. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE)

SC23PMJDSCMIC401A: INDUSTRIAL MICROBIOLOGY
PRACTICAL PART B

List of Practicals

1. Study different parts of fermenter
2. Primary screening of Antibiotic producing bacteria: Crowded plate technique
3. Primary screening of Antibiotic producing bacteria: Wilkin's Method
4. Primary screening of organic acid producing bacteria
5. Primary screening of Amylase producing bacteria
6. Primary screening of Protease producing bacteria
7. Fermentative production of Antibiotics
8. Fermentative production of organic acids
9. Concept of inoculum development
10. Paper chromatography
11. Thin layer chromatography
12. Sterility testing

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGYSEMESTER IV
PROGRAM CODE: SCIUG105
MINOR DISCPLINE SPECIFIC COURSE CODE: SC23MIDSCMIC402

FOOD AND DAIRY MICROBIOLOGY

Total Credits- 02 (02 Period/Week)	**Theory**	**External-25 Marks**
		Internal-25 Marks

Course Objectives:

- This course will help understand the current trends and concepts related to Microbiology of food and other dairy products.
- Gives an insight into various types of food borne diseases and their prevention.

Unit-1 Food Microbiology

- Microbial flora of fresh food
- Microbial spoilage of foods: Fresh foods & canned foods
- Food Borne infection & intoxication: Role of *S. aureus*, *C. botulinum* & *Salmonella Spp*. in food poisoning
- Methods of food preservation, Food quality control measures.
- Brief introduction about fermented foods: Pickles, Sauerkraut, Silage, Sausages & Bread.

Unit-2 Dairy Microbiology

- Milk as a medium, normal flora of milk
- Spoilage of milk & milk products
- Microbial analysis of milk: SPC, Direct count, MBRT, Resazurin test.
- Fermented Dairy Products: Starter Culture, Cheese, Yogurt, Buttermilk, Acidophilus milk, Kefir
- Preservation of milk: Principles & methods of preservation

Course Outcomes:

- Understand the significance and activities of microorganisms in food the role of intrinsic and extrinsic factors on growth and survival of microorganisms and attain information on microbial food spoilage.

- Understand the principles in traditional food preservation techniques including salting, pickling, refrigeration, freezing, oxidation, and canning/bottling and chemical preservation.
- Analyze types of starter cultures like Lactic acid bacteria, fermented milk products, probiotics, SCP and Edible mushrooms.
- Acquire& remember the microbes causing food intoxications and food infections.

Reference Books:

1. Fundamentals of Microbiology By Frobisher M.: 9th edition
2. Microbiology by Pelczar M.J. & Chain E.C.S. : 5th edition
3. Industrial Microbiology by Prescott S.C. : 3rd edition
4. Food Microbiology by Frazier W.C. : 3rd edition
5. Food science & Experimental foods By Swaminathan M.
6. Modern food microbiology by J James.
7. Fundamentals of Dairy Microbiology by Prajapati J.B.
8. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-I, Aditya Publications, Ahmedabad, India.
9. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-II, Aditya Publications, Ahmedabad, India.
10. Dubey. R.C., Maheshwari. D.K., Practical Microbiology, S.Chand & Company Ltd., New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER IV
PROGRAM CODE: SCIUG105
PRACTICAL MINOR DISCPLINE SPECIFIC COURSE CODE:SC23PMIDSCMIC402

FOOD AND DAIRY MICROBIOLOGY

Total Credits- 02 (04 Period/Week)	**External-25 Marks**
	Internal- 25 Marks

List of Practical

1. Standard qualitative analysis of milk.
2. Methylene Blue Reduction Time test for milk.
3. Isolation of food borne microorganisms from vegetables and fruits.
4. Isolation of food borne microorganisms from milk.
5. Isolation of microorganisms from spoilage food.
6. Isolation of fungi from Bread.
7. Preparation of Yogurt.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME B. SC. MICROBIOLOGY SEMESTER IV
PROGRAM CODE: SCIUG105
PRACTICAL MAJOR DISCPLINE SPECIFIC COURSE CODE:SC23PMJDSCMIC401 & SC23PMJDSCMIC401A

MOLECULAR BIOLOGY AND GENETICS PRACTICAL PART A
INDUSTRIAL MICROBIOLOGY PRACTICAL PART B

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 50**

MOLECULAR BIOLOGY AND GENETICS PRACTICAL PART A

Q 1	Perform the given experiment, Write principle, Methodology and show your results to the examiner	**10**
Q 2	Perform the given experiment, Write principle, Methodology and interpret your results	**05**
Q 3	Spotting	**04**
Q 4	Viva-voce	**04**
Q 5	Journal submission	**02**

INDUSTRIAL MICROBIOLOGY PRACTICAL PART B

Q 1	Perform the given experiment, Write principle, Methodology and show your results to the examiner	**10**
Q 2	Perform the given experiment, Write principle, Methodology and interpret your results	**05**
Q 3	Spotting	**04**
Q 4	Viva-voce	**04**
Q 5	Journal submission	**02**

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATANCOURSE NAME

B. SC. MICROBIOLOGY SEMESTER IV

PROGRAM CODE: SCIUG105

PRACTICAL MINOR SPECIFIC COURSE CODE: SC23PMIDSCMIC402

FOOD AND DAIRY MICROBIOLOGY

PRACTICAL SKELETON

Time: 3 Hours **Total Marks: 25**

Q 1	Perform the given experiment, Write principle, Methodology and show your results to the examiner	**10**
Q 2	Perform the given experiment, Write principle, Methodology and interpret your results	**05**
Q 3	Spotting	**04**
Q 4	Viva-voce	**04**
Q 5	Journal submission	**02**

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 24-25 under NEP

Syllabus B.Sc. (Biotechnology) Sem-III and IV

Sr. No.	Course code	Study components	Instructions Hrs./week	Examination			Credit	Exam Hours
				Continuous & Comprehensive Evaluation (CCE)	Semester End Evaluation (SEE)	Total		
Semester III								
Theory Course (DSC)								
1	SC23MJDSCBIO301	Concept of Metabolism	04	50	50	100	4	2:30
2	SC23MJDSCBIO301A	Food and Dairy Biotechnology	04	50	50	100	4	2:30
3	SC23MDCBIO303	Introduction to Metabolism	02	25	25	50	2	2:00
Practical Course (PDSC)								
4	SC23PMJDSCBIO301 (Group A) & SC23PMJDSCBIO301A (Group B)	Concept of Metabolism & Food and Dairy Biotechnology	4 (Group A + Group B)	50	25 Group A 25 Group B	25 Group A 25 Group B	4	5:00
5	SC23PMDCBIO303	Introduction to Metabolism	02	25	25	50	2	2:30
Ability Enhancement Course								
6	SC23AECBIO304	English	02	---	50	50	2	2:00
Indian Knowledge System (IKS)								
7	---	To be chosen from basket offered by university	02	---	50	50	2	2:00
Skill Enhancement Course (SEC)								
8	SC23SECBIO306	Molecular Diagnostics	02	---	50	100	2	2:00
			22	200	350	550	22	

Semester IV								
Theory Course (DSC)								
1	SC23MJDSCBIO401	Industrial Biotechnology	04	50	50	100	4	2:30
2	SC23MJDSCBIO401A	Molecular Biology	04	50	50	100	4	2:30
3	SC23MIDCBIO402	Fermentation Technology	02	25	25	50	2	2:00
Practical Course (PDSC)								
4	SC23PMJDSCBIO401 (Group A) & SC23PMJDSCBIO401A (Group B)	Industrial Biotechnology & Molecular Biology	4 (Group A + Group B)	50	25 Group A 25 Group B	25 Group A 25 Group B	4	5:00
5	SC23PMIDCBIO402	Fermentation Technology	02	25	25	50	2	2:30
Ability Enhancement Course								
6	SC23AECBIO404	English	02	---	50	50	2	2:00
Value Added Course								
7	---	To be chosen from basket offered by university	02	---	50	50	2	2:00
Skill Enhancement Course (SEC)								
8	SC23SECBIO406	Enzymology	02	---	50	100	2	2:00
			22	200	350	550	22	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER IV

Industrial Biotechnology **SC23MJDSCBIO401**

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

Total Credits- 04 (04 Periods/ Week)	**Theory**	External **50 marks**
		Internal **50 marks**

Program Outcome

1.

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 industrial Biotechnology Brief history & Range of Fermentation products Isolation of Industrially important microbial strain Primary & Secondary Screening Isolation & Enrichment methods Strain improvement Application of r-DNA technique in strain construction Techniques for the preservation of strain	1	15
2	UNIT-2	Fermentor Design & criteria of ideal fermentor Introduction to Aeration & Agitation Growth kinetics Batch, Fed batch & continuous culture Starter culture Importance & preparation	1	15
3	UNIT-3	Raw materials used in fermentation media Measurement & control of process parameters Medium sterilization Batch & Continuous sterilization Medium formulation for industry	1	15
4	UNIT-4	Overview of downstream processing Methods for separation of solid & liquid Cell disintegration methods Fermentation of penicillin Antibiotic	1	15

References:

Whittaker: principles of fermentation technology
Casida: industrial Microbiology

SC23PMJDSCBIO401 (Group A) Industrial Biotechnology Practicals

1. Isolation of amylase enzyme producing microorganism from soil.
2. Isolation of protease enzyme producing microorganism from soil.
3. Isolation of lipase enzyme producing microorganism from soil.
4. Isolation of antibiotic producing microorganism from soil by crowded method.
5. Isolation of antibiotic producing microorganism from soil by wilkin's method.
6. Bioassay of penicillin.
7. Study the growth curve of bacteria.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER IV

Molecular Biology **SC23MJDSCBIO401A**

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

Total Credits- 04 (04 Periods/ Week)	**Theory**	External **50 marks**
		Internal **50 marks**

Program Outcome

2.

Course Outcome

5. Course will help students in understanding basics of biotechnology and its applied areas.
6. Students will understand use of biotechnology in Agriculture sector.
7. Course targets application of biotechnology in human health care.
8. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.

No.			Credit	Hrs.
1	UNIT-1	Structure of DNA & RNA Different forms of DNA Replication of DNA in prokaryotes Enzymes & proteins Initiation, elongation & termination Replication in Eukaryotes Enzymes & proteins Initiation, elongation & termination	1	15
2	UNIT-2	Transcription in bacteria Transcription cycle, RNA polymerase, Role of sigma factor, Bacterial promoter, RHO dependent & independent termination of transcription Transcription in Eukaryotes Types of RNA polymerase, Transcription of protein coding gene Post transcription modification Capping & Tailing Post transcription modification Splicing	1	15
3	UNIT-3	Genetic code Discovery & properties Protein synthesis in bacteria Bacterial Ribosome, initiation, elongation & termination of Translation Protein synthesis in Eukaryotes Eukaryotic ribosome, initiation, elongation & termination of Translation Modes of Gene regulation Operon system & lac operon	1	15
4	UNIT-4	Modes of gene transfer in bacteria Process of transformation in bacteria Transduction as a mode of gene transfer Specialize & Generalize transduction Conjugation in bacteria	1	15

References:

Lehninger Principle of Biochemistry: David L. Nelson & Michael M. Cox
Molecular biology of gene: James D. Watson
GENES 8: Lewin

SC23PMJDSCBIO401A (Group B) Molecular Biology Practicals

1. Introduction molecular biotechnology laboratory.
2. Isolation of DNA from bacterial source.
3. Isolation of DNA from plant source.
4. Isolation of DNA from animal tissue.
5. Quantification of DNA.
6. Agarose gel electrophoresis of DNA.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER IV

Fermentation Technology **SC23MIDCBIO402**

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **25 marks**
		Internal **25 marks**

Program Outcome 1.
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	Range of fermentation technology. Screening methods. Strain improvement method. Preservation methods for industrially important strain.	1	15
2	UNIT-2	Basic Design & layout of industry level fermentor. Aeration & Agitation. Starter culture. Inoculum preparation method for Baking & Brewing Yeast.	1	15

References:

Whittaker: principles of fermentation technology
Casida: industrial Microbiology

SC23PMIDCBIO402 Fermentation Technology Practicals

1. Isolation of amylase enzyme producing microorganism from soil.
2. Isolation of protease enzyme producing microorganism from soil.
3. Isolation of lipase enzyme producing microorganism from soil.
4. Isolation of antibiotic producing microorganism from soil by crowded method.
5. Isolation of antibiotic producing microorganism from soil by wilkin's method.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIUG106 **BT (Biotechnology)**

SEMESTER IV

Enzymology **SC23SECBIO406**

EFFECTIVE FROM JUNE 2024-25 UNDER NEP

Total Credits- 02 (02 Periods/ Week)	**Theory**	External **25 marks**
		Internal **25 marks**

Program Outcome

2.

Course Outcome

5. Course will help students in understanding basics of biotechnology and its applied areas.
6. Students will understand use of biotechnology in Agriculture sector.
7. Course targets application of biotechnology in human health care.
8. Course aims to create basic understanding of use of biotechnology in resolution of various problems such as environmental pollution.

No.			Credit	Hrs.
1	UNIT-1	Enzyme classification (rationale, overview and specific examples) Zymogens and their activation (Proteases and Prothrombin). Enzyme substrate complex: concept of E-S complex, binding sites, active site, specificity, Kinetics of enzyme activity, Michaelis-Menten equation and its derivation, Km and Vmax Two substrate reactions (Random, ordered and ping-pong mechanism) Enzyme inhibition Mechanism of enzyme action Examples-: chymotrypsin, Iysozyme, GPDH, aldolase, RNase, Carboxypeptidase and alcohol dehydrogenase. Enzyme regulation	1	15
2	UNIT-2	Allosteric enzymes Negative cooperativity and half site reactivity. Enzyme - Enzyme interaction, Protein ligand binding, Hill and scatchard plots, Isoenzymes Multienzyme complexes. Ribozymes. Multifunctional enzyme-eg Fatty Acid synthase. Enzyme Technology: Methods for immobilization of enzymes. Immobilized enzyme reactors.	1	15

References:

Biochemistry, Lubert Stryer, 6th Edition, WH Freeman, 2006.
Harper's illustrated Biochemistry by Robert K. Murray, David A Bender, Kathleen M.Botham, Peter J. Kennelly, Victor W. Rodwell, P. Anthony Weil. 28th Edition, McGrawHill, 2009.
Biochemistry, Donald Voet and Judith Voet, 2nd Edition, Publisher: John Wiley andSons, 1995.
Biochemistry by Mary K.Campbell & Shawn O.Farrell, 5th Edition, Cenage Learning,2005.
Fundamentals of Enzymology Nicholas Price and Lewis Stevens Oxford University Press 1999
Fundamentals of Enzyme Kinetics Athel Cornish-Bowden Portland Press 2004
Practical Enzymology Hans Bisswanger Wiley–VCH 2004

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. (Mathematics)

Detailed Syllabus as per NEP with Effect from July 2024

FACULTY:	**SCIENCE**
SUBJECT:	**MATHEMATICS**
PROGRAMME NAME:	**BACHELOR OF SCIENCE**
PROGRAMME CODE:	**SCIUG107**
SEMESTER:	**III to IV (2nd Year)**
TOTAL PAGE:	**01 TO 34 (with First Cover Page)**
DATE:	**Feb -2024**

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 III	MJDSC	MAT301	4	4	60	50	50	100	2.5Hrs	2/33
		Practical MAT301	10	2	60	25	25	50	Min 3 Hrs	4/33
		MAT301A	4	4	60	50	50	100	2.5Hrs	6/33
		Practical MAT301A	10	2	60	25	25	50	Min 3 Hrs	8/33
	MDC	MAT303	2	2	30	25	25	50	2Hrs	10/33
		Practical MAT303	10	2	60	25	25	50	Min 3 Hrs	12/33
	SEC	MAT306	2	2	30	25	25	50	2.0Hrs	14/33
Semester IV	MJDSC	MAT401	4	4	60	50	50	100	2.5Hrs	16/33
		Practical MAT401	10	2	60	25	25	50	Min 3 Hrs	18/33
		MAT401A	4	4	60	50	50	100	2.5Hrs	20/33
		Practical MAT401A	10	2	60	25	25	50	Min 3 Hrs	22/33
	MIDSC	MAT402	2	2	30	25	25	50	2Hrs	25/33
		Practical MAT402	10	2	60	25	25	50	Min 3 Hrs	27/33
	SEC	MAT406	2	2	30	25	25	50	2.0Hrs	29/33
Sem 3&Sem 4			Evaluation System for CCE and SEE							31/33

B.Sc. (Mathematics) SEMESTER-4 Syllabus

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**IV**
COURSE NAME:	**Major Discipline Theory Course**
COURSE CODE:	**SC23MJDSCMAT401**
PAPER NAME	**Advanced Calculus**
With Effect From :	**JULY 2024**
Total Theory Credits:	**04 (0 4 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	To get introduced to the concept of a regular parameterized curve in $\mathbb{R}^2$. Also able to find the curvature, singular and multiple points for curve.
2	Understand the concept of Beta and Gamma functions with their applications.
3	To understand the concept of multiple integrals and its applications in terms of Area and Volume.
4	To study of vector differentiation and integration in two & three dimensional spaces as it is prerequisite in various fields of science and engineering.

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	1	**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)	1	15
2	2	**Multiple Integral:** Double integral, integral on non-rectangular region, transformation to polar co-ordinate, change of order of integration, triple integration, transformation to polar and cylindrical co-ordinate.	1	15
3	3	**Improper Integral:** **Beta Function :** Definition of Beta functions and its properties, Applications of Beta functions, several forms of Beta functions. **Gamma Function :** Definitions of Gamma function and its properties, Applications of gamma functions, several forms of Gamma functions, Relation between Beta and Gamma function.	1	15
4	4	**Vector analysis, line and surface integral:** [**Revision:** Gradient of scalar functions, divergence and curl of vector functions] Line integrals, Applications of line integrals, Fundamental theorem for line integrals, Conservative vector fields, Green's theorem, Area as a line integral, Surface integrals, Stokes' theorem, The Gauss divergence theorem.	1	15

References:	
1	**Textbook:** The main book for the course is '**Integral Calculus'** by Shantinarayan, S. Chand , New Delhi.
2	Advanced Calculus, D V Widder , Prentice Hall , New Delhi.
3	Advanced Calculus Vol : I & II, T M Apostol, Blaisdoll
4	Advanced Calculus, R C Buck, MacMillan
Further Reading:	
1	KalanShashtra Part I , D H Pandya and N D Suthar, University GranthNirman Board (Gujarati)
2	KalanShashtra Part II, A M Vaudya and V H Pandya, University GranthNirman Board (Gujarati)

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**B. Sc.**
SEMESTER:	**IV**
COURSE NAME:	**Major Discipline Practical Course**
COURSE CODE:	**SC23PMJDSCMAT401**
PAPER NAME	**Practical on Advanced Calculus**
Practical Credit:	**02 (04 hours) (per15 students batch in a week)**
Exam Pattern:	**25 Marks (CCE) + 25 Marks (SEE) = 50 Marks**
With Effective From:	**July 2024**

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.	To get introduced to the concept of a regular parameterized curve in $\mathbb{R}^2$. Also able to find the curvature, singular and multiple points for curve.
2.	Understand the concept of Beta and Gamma functions with their applications.
3.	To understand the concept of multiple integrals and its applications in terms of Area and Volume.
4.	To study of vector differentiation and integration in two & three dimensional spaces as it is prerequisite in various fields of science and engineering.

PracticalDetails	
1.	To find radius of curvature of a curve.
2.	Application of double Integration.
3.	Application of triple integration.
4.	Application of change of order of integration.
5.	Application of Gamma Function.
6.	Application of Beta Function.
7.	Application of line integral.
8..	Application of Green's Theorem.
9.	Application of Stokes' theorem.
10.	Application of Gauss divergence theorem.
Note: Minimum practical to be performed: 08	
References:	
1.	**Textbook:** The main book for the course is '**Integral Calculus'** by Shantinarayan, S. Chand , New Delhi.
2.	Advanced Calculus, D V Widder , Prentice Hall , New Delhi.
3.	Advanced Calculus Vol : I & II, T M Apostol, Blaisdoll
4.	Advanced Calculus, R C Buck, MacMillan
Further Reading:	
1.	KalanShashtra Part I , D H Pandya and N D Suthar, University GranthNirman Board (Gujarati)
2.	KalanShashtra Part II, A M Vaudya and V H Pandya, University GranthNirman Board (Gujarati)

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**IV**
COURSE NAME:	**Major Discipline Theory Course**
COURSE CODE:	**SC23MJDSCMAT401A**
PAPER NAME	**Linear Algebra**
With Effect From :	**JULY 2024**
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	Relate matrices and linear transformations, compute eigen values and eigen vectors of linear transformations
2	To understand the concept of inner product space and its applications and its properties.
3	Able to use the concept of linear operator using linear functional.
4	Understand the concept of eigen values and eigen vector of linear transformation

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	**1**	**Matrix of a linear transformations:** 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.	**1**	**15**
2	**2**	**Inner product space:** Definition of inner product space, norm, orthogonality, Schwarz's and triangular inequality, parallelogram law, orthonormal basis, Gram-Schmidt orthogonalization process (without proof) and its examples.	**1**	**15**
3	**3**	**Linear Functional and Duality:** Definition of linear functional and its examples, Defination of Dual space and Dual basis and its examples, Adjoint of a linear operator - its properties and examples.	**1**	**15**
4	**4**	**Eigen values and Eigen vectors:** Eigen values and eigen vectors of a linear transformation, characteristic polynomial, Caley-Hamilton theorem, using C-H theorem find inverse of matrix, minimal polynomial deductions.	**1**	**15**

References:

1	**An Introduction to Linear Algebra'** by V. Krishnamurthy, V P Mainra, J L Arora, Affiliated East-west Press Pvt Ltd., New Delhi.
2	Linear Algebra , Ramchandra Rao, P. Bhimasankar, Tata MacGrawHill
3	Topics in Algebra, I N Herstein, Wiley Eastern Ltd
4	Linear Algebra, S K Berberion, Oxford University Press

Further Reading:

1	Linear Algebra Problem Book, P R Holmos, Cambridge University Press
2	Linera Algebra, Sharma and Vashishtha, Krishna Prakashan, Meerut
3	Linear Algebra, Gupta K P, PragatiPrakashan, Meerut

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**B.Sc.**
SEMESTER:	**IV**
COURSE NAME:	**Major Discipline Practical Course**
COURSE CODE:	**SC23PMJDSCMAT401A**
With Effect From :	**JULY 2024**
Total Practical Credits:	**02 (04 Period /Week) (Batch of 15 Students)**
Marks:	**External :25 + Internal : 25 = Total :50**

The basic requirement for the smooth and better conduction of the p ractical program:	
1	Must require a Computer operator 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	**Data Analysis with Microsoft Excel:** • Students should gain a good understanding of Excel functions and tools relevant to mathematical functions. • They should be able to use Excel for tasks like organizing data, generating charts, and performing basic statistical analyses.
2	**Mathematical Problem Solving with Microsoft Excel:** • Students should gain a good understanding of Excel functions and tools relevant to mathematical problem solving. • They should be able to use Excel for tasks like organizing large data and their solutions.

3	**Real-World Problem Solving with Microsoft Excel:** • It will help students in research projects for getting easy solutions to compact problems. • It will help to solve differentiation, Integration, Probability, Frequency distribution, regression analysis, correlation etc.

PracticalDetails	
Unit-1	**Microsoft Office Excel Tools used to s olve problems involve Differentiation, Integration & its applications**
1	**Solve problems involve Differentiation & its ap plications (Four Practical)** • Limits • Rate of Change • Extrema of Functions of Several Variables • Lagrange Multipliers **(Questions to be asked i n Practical: Solving a Limit Problem, Finding Extreme Points, Obtaining Derivatives, Example using Lagrange's Multiplier Method using Excel Solver)**
2	**Solve problems involve I ntegration & its applications (Four Practical)** • Numerical Integration: Trapezoidal Rule, Simpson's Rule • The Definite Integral **(Questions to be asked in Practical: S olving aintegration problem using Trapezoidal rule, Simpson's rule, definite integral problems)**
Unit-2	**Statistical Data Analysis used in Mathematical Research& Power Point presentation**
1	**Regression Analysis used i n Mathematical Research (Three Practical)** • Linear Regression • Quadratic Regression • Exponential Regression **(Questions to b e asked in Practical: Ask for finding regression lines using given data)**
2	**Probability Problems u sed in Mathematical Research (Four Practical)** • Factorial • Permutations &Combinations • Expected Value • Binomial Probability **(Questions to be asked in Practical: Ask for finding Probability)**
3	**Power Point presentation** **(Questions to be asked in Practical: To make a PowerPoint presentation on any theorem of syllabus)**

References:	
1	"Excel Spreadsheet Manual for Applied Mathematics" by StelaPudar-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.**
SEMESTER:	**IV**
COURSE NAME:	**Minor Discipline Theory Course**
COURSE CODE:	**SC23MIDSCMAT402**
PAPER NAME	**Fundamentals of Numerical Analysis**
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	To identify the solution of problems using Numerical Methods.
2	Able to find numerical solutions of system of linear equations and to check the accuracy ofthe solutions.
3	To learn about various interpolating and extrapolating methods to find numericalsolutions.
4	To solve initial and boundary value problems in differential equations using numericalMethods.

SR. NO.	UNIT	DETAILS	CREDIT	Total Hrs.
1	**1**	**Finite Differences and Theory of interpolation:** Ascending and descending differences, Symbolic operators, Relation between operators, Forward Difference Table and Backward Difference Table,Difference of polynomial, factorial polynomials.Interpolation**,** Gregory-Newton's forward difference interpolation formula and Gregory-Newton's backward difference interpolation formula and it's applications.	**1**	**15**
2	**2**	**Divided Differences&Central Difference interpolation formula:**Newton's divide difference interpolation formula, Lagrange's interpolation formula for equal and unequal intervals. Gauss forward and backward formula, Stirling interpolation formula, Bessel's interpolation formula.	**1**	**15**
References:				
1	Numerical Analysis by Kunz, McGraw Hill.			
2	Numerical Analysis by R. Gupta, AnmolPub.Pvt.Ltd, New Delhi.			
3	Numerical Methods by Dr.V.N.Vedomurthy, Vikas Publishing House Pvt.Ltd .			
4	Numerical Analysis by P.N.Chatterji, Rajson'sPrakashanmandir, Meerut.			
Further Reading:				
1	Numerical Methods in Engineering and Science, Dr.B.S.Grewal,Khanna Pub.			
2	Numerical Analysis and Computational Procedures, S.A.Mollah, New Central Book Agency, Calcutta.			

Hemchandracharya North Gujarat University, Patan	
As per NEP – 2020	
SUBJECT:	**MATHEMATICS**
PROGRAM CODE:	**B. Sc.**
SEMESTER:	**IV**
COURSE NAME:	**Minor Discipline Practical Course**
PAPER NAME:	**Practical on Fundamentals of Numerical Analysis**
COURSE CODE:	**SC23PMIDSCMAT402**
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 2024**

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.	To identify the solution of problems using Numerical Methods.
2.	Able to find numerical solutions of system of linear equations and to check the accuracy ofthe solutions.
3.	To learn about various interpolating and extrapolating methods to find numericalsolutions.
4.	To solve initial and boundary value problems in differential equations using numericalMethods.

Sr. No.	**Details of Practical**
1.	Construct the Difference Table and find out given terms.
2.	Represent given polynomial into Factorial polynomial and find second differences.
3.	Application of Gregory-Newton forward Interpolation formula.
4.	Application of Gregory-Newton Backward interpolation formula.
5.	Application of Newton Divided Difference Formula.
6.	Application of Lagrange’s interpolation formula for unequal intervals.
7.	Application of Gauss forward interpolation formula.
8..	Application of Gauss backward interpolation formula.
9.	Application of Sterling interpolation formula
10.	Application of Bessel’s interpolation formula.
Note: Minimum practicals to be performed: **08**	

References:	
1.	Numerical Analysis by Kunz, McGraw Hill.
2.	Numerical Analysis by R. Gupta, AnmolPub.Pvt.Ltd, New Delhi.
3.	Numerical Analysis byP.N.Chatterji, Rajson'sPrakashanmandir, Meerut.
Further Reading:	
1.	Numerical Methods in Engineering and Science, Dr.B.S.Grewal,Khanna Pub.
2.	Numerical Analysis and Computational Procedures, S.A.Mollah, New Central Book Agency, Calcutta.

Hemchandracharya North Gujarat University, Patan	
As per NEP-2020	
SUBJECT :	**MATHEMATICS**
PROGRAM CODE:	**(B.Sc.) SCIUG107**
SEMESTER:	**IV**
COURSE NAME:	**Skill Enhancement Theory Course**
COURSE CODE:	**SC23SECMAT406**
PAPER NAME:	**Mathematics for Competitive Exams-4**
With Effect From :	**JULY 2024**
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**	**Pipes and Cisterns** Important Points **Speed, Time and Distance** Basic Formulae Related to Speed, Time and Distance **Problems Based on Trains** Basic Rules Related to Problems Based on Trains **Boats and Streams** Basic Formulae Related to Boats and Streams	**1**	**15**
2	**2**	**Races and Games of Skill** Important Terms • Some Facts about Race **Clock and Calendar** Clock • Important Points Related to Clock Calendar • Ordinary Year • Leap Year • Odd Days **Linear Equations** Linear Equations in One, Two and Three Variables • Methods of Solving Linear Equations, • Consistency of the System of Linear Equations	**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,લિબર્ટીકેરિયરએકેડેમી.			

Methods of assessing the Major Theory CourseOutcomes for Sem 3 and Sem 4

- **Components* of CCE (Continuous and Comprehensive Evaluation): 50 marks**

Sr. No.	Component	Duration (if any)	Marks
1	Daily/Weekly/Monthly Unit Test/ Exam	2 hours	25
2	Assignment/ Quiz Test		10
3	Development of Soft Skills		05
4	Class activity		05
5	Attendance		05
Grand Total			50

1	Development of Soft Skills	• Seminar • Group Discussion
2	Class activity	• Problem Solving • Work base tanning • Reading Analysing

- **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 3 and Sem 4

- **Components* of CCE (Continuous and Comprehensive Evaluation): 25 marks**

Sr. No.	Component	Duration (if any)	Marks
1	Daily/Weekly/Monthly Unit Test/ Exam	2 hours	15
2	Assignment/ Quiz Test, Development of Soft Skills and Class activity		05
3	Attendance		05
Grand Total			25

1	Development of Soft Skills	• Seminar • Group Discussion
2	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:3&4
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.-3 & 4)
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)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

SCIENCE/ HOME SCIENCE (B.Sc.) PROGRAMME
IN
ENGLISH

ABILITY ENHANCEMENT COURSE

SEMESTER: 3
1 SC23AECENG304 COURSE

SEMESTER: 4
2 SC23AECENG404 COURSE

SEMESTER SYSTEM

SCHEME OF EXAMINATION

AND

SYLLABUS

AS PER THE NEW N E P GUIDELINES

(FOR SEM 3 & 4 WITH EFFECT FROM JUNE-2023)

SCHEME OF EXAMINATION

ABILITY ENHANCEMENT COURSE

1 SC23AECENG304 COURSE

2 SC23AECENG404 COURSE

SCIENCE B.Sc. (ENGLISH)

(FOR BOTH SEMESTERS 3 & 4 COURSES)

Time: 2 Hrs. **Total Marks: 25**

Q.1 (A) Attempt five short questions out of eight. (From prescribed text) (Unit-I) (05)

Q.1 (B) Vocabulary Text Based (Match the Words) (Unit-I) (05)

Q.2 Fill in the blanks with multiple choices. Six blanks from each grammatical topic of Unit-II (Ten out of Twelve) (10)

Q.3 An unseen paragraph for comprehension with short questions (Unit-III) (05)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

COURSE NAME: ABILITY ENHANCEMENT COURSE

SEMESTER 4

PROGRAM CODE: **SC23AECENG404**

ENGLISH

COURSE CODE **AEC 404**

EFFECTIVE FROM JUNE 2023 UNDER NEP

Total Credit – 02 (02 Period/Week)

Programme Outcome & Course Outcome:

1. **It will enhance students' communication skills**
2. **Impart employability skills to students**
3. **Prepare students for competitive examinations**
4. **It will inculcate and enhance reading habits in Under Graduate Students**
5. **It will enable students to learn basic grammar through the practice of prescribed topics**
6. **It will enable students to read and comprehend short passages**
7. **It will enhance the ability of students to write short answers**
8. **It will inculcate ability to create CV**
9. **It will inculcate human values and ethics in order to enable students to become good citizens of the country**

Sr. No.	Unit		Credit	Hr
	Unit 1	Lesson 5 to 8 from text 'Glimpses'- Frank Bros. & Co.		
	Unit 2	Grammar- Tenses Modal Auxiliaries		
	Unit 3	Comprehension of Unseen Passage		

Further Reading: **High School English Gram & Comp by Wren and Martin**
Practical Grammar and Composition Book by Thomas Wood