SRIPAT SINGH COLLEGE

(Estd. 1949 Govt. Sponsored)

P.O. Jiaganj, Dist. Murshidabad, West Bengal, PIN–742123

Phone: 03483-255351, Fax: 03483-256961, Email: sscollege2009@gmail.com

ACADEMIC CALENDAR
SESSION: January'25-June'25
Even Semester (II+IV+VI)
Stream: Science
Distribution of Courses

List. 1 Academic and Prospectus Committee

Sl.	Members
1.	Dr. Kamal Krishna Sarkar, Chairperson, Principal
2.	Dr. Mitali Tikadar (ex-officio, TCS)
3.	Dr. Sagar Simlandy ((ex-officio, IQAC Coordinator)
4.	Dr. Shibu Paul (Convenor)
5.	Dr. Md. Habib, Member
6.	Dr. Amit Kumar Kundu, Member
7.	Ashok Raj Mahali
8.	Suraiya Yeasmin,
9.	Sabina Yeasmin, Member

Department (HoDs) (Arts Stream)

Sl.	Name of Departments	Names of HODs
1.	Physics	Paban Bitter
2.	Mathematics	Dr. Sudhanshu Kr. Biswas
3.	Chemistry	Dr. Amit Kumar Kundu
4.	Botany	Dr. Suchetana Mukherjee
5.	Zoology	Dr. Sajal Kr. Dey
6.	Molecular Biology and Bio Technology	Dr. Abhishek Basu
7.	Economics	Arunava Kr. Chowdhury
8.	Geography	Dr. Sakti Mandal
9.	Computer Science	Utsab Dutta
10.	Environment Science	Amitava Bhattacharya

Introduction

The Academic Calendar for the Science Stream for all the students of the Ten Science Departments of Sripat Singh College including Physics, Mathematics, Chemistry, Botany, Zoology, Molecular Biology and Bio Technology, Economics, Geography, Computer Science and Environment Science. This Calendar is prepared by the Academic Calendar and Prospectus Committee (List: 1) with the full support and help of all HODs (List:2) of the above-mentioned departments.

Sripat Singh College

ACADEMIC CALENDAR: SESSION- January 25-June 25

Stream: Science

DISTRIBUTION OF COURSES

DEPARTMENT OF: Physics

Major: II

Courses	Courses Title	Topic	No. Of Lectures	Teachers
Theory **PHY-M-T-2:** **Marks (Semester End - 40, Internal Assessment – 10)** **Theory: (4 Credits) No. of Lectures - 60**	**MECHANICS**	**Unit-1-** **Fundamentals of Dynamics:** **Unit-II** A) Work and Energy B) Collisions C) Elasticity **Unit-III** A) Rotational Dynamics **Unit-IV** A) Fluid Motion B) Gravitation and Central Force Motion **Unit-V** Motion of a particle under a central force field **Unit-VI** A) Oscillations:SHM B) Non-Inertial Systems **Unit-VII** Special Theory of Relativity	**6** **10** **12** **5** **6** **11** **10**	**NH** **AH** **SM** **PB** **PB** **DPD** **SB**
PRACTICAL **PHY-M-P-2:** Marks (Semester End - 20, Internal Assessment – 5) (Lab. Note Book - 05, Viva-Voce-05, Experiment -10) Practical - (2 Credits) No. of Lectures - 60	**MECHANICS**	1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. 2. To study the random error in	**60**	**AH+SM+DPD**

		observations. 3. To determine the height of a building using a Sextant. 4. To study the Motion of Spring and calculate (a) Spring constant, (b) g 5. To determine the Moment of Inertia of a Flywheel/ a rigid body. 6. To determine g and velocity for a freely falling body using Digital Timing Technique13 | P a g e 7. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). 8. To determine the Young's Modulus of the material of a bar by flexure method 9. To determine the Modulus of Rigidity of a Wire by - Dynamic Method. 10. To determine the elastic Constants of a wire by Searle's method. 11. To determine the value of g using Bar Pendulum. 12. To determine the value of g using Kater's Pendulum.		

		13. To draw the frequency - resonance length curve of a sonometer wire and to determine an unknown frequency of a tuning fork 14. Measurement of coefficient of viscosity by Stoke's method.		
Theory PHY-SEC-T-2: Marks (Semester End – 35, Internal Assessment – 10) Internal Assessment [(Class Test/ Assignment/ quiz etc) - 10] Theory: (3 Credits) No. of Lectures - 45	**BASIC INSTRUMENTATION SKILLS**	**Unit-I-:** **A)** Basic of Measurement **B)** Electronic Voltmeter **Unit-II-** A) Cathode Ray Oscilloscope B) Signal Generators and Analysis Instruments **Unit-III** A) : Impedance Bridges & Q-Meters B) Digital Instruments C) Digital Multi meter	**12** **19** **14**	**NH** **PB** **SM**

Minor: II

courses	Courses Title	Topic	No. of Lectures	Teachers
Theory PHY-MI-T-2: Marks (Semester End - 30, Internal Assessment – 5) Theory – (3 Credits) No. of Lectures - 45	**MECHANICS**	**Unit-I** A) Laws of Motion B) Momentum and Energy C) Rotational Motion **Unit-II**- A) Non-Inertial Systems	**13** **16**	**NH** **AH**

		B) Gravitation C) Collisions D) Oscillations **<u>Unit-III-</u>** A) Elasticity B) Fluid Motion C) Special Theory of Relativity	**16**	**SB**
Practical **PHY-MI-P-2:** Marks (Semester End - 10, Internal Assessment – 5) Practical - (1 Credits) No. of Lectures - 30	**MECHANICS**	1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. 2. To study the random error in observations. 3. To determine the height of a building using a Sextant. 4. To study the Motion of Spring and calculate (a) Spring constant, (b) g 5. To determine the Moment of Inertia of a Flywheel/ a rigid body. 6. To determine g and velocity for a freely falling body using Digital Timing Technique 7.To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). 8.To determine the	**30**	**PB+NH+SB**

		Young's Modulus of the material of a bar by flexure method 9.To determine the Modulus of Rigidity of a Wire by - Dynamic Method. 10.To determine the elastic Constants of a wire by Searle's method. 11.To determine the value of g using Bar Pendulum. 12.To determine the value of g using Kater's Pendulum. 13.To draw the frequency - resonance length curve of a sonometer wire and to determine an unknown frequency of a tuning fork 14. Measurement of coefficient of viscosity by Stoke's method.		

Sripat Singh College

Academic Calendar: Session- January 25-June 25
Stream: Science
DISTRIBUTION OF COURSES
DEPARTMENT OF: Physics

Sem-IV **(Major)**

Courses	Courses Title	Topic	No. Of Lectures	Teachers
Theory **PHY-M-T-4:** **Marks (Semester End - 40, Internal Assessment – 10)** **Theory: (4 Credits) No. of Lectures - 60**	**WAVE OPTICS and ELECTROMAGNETIC THEORY**	**Unit-1-** **a) Superposition of Two Harmonic Waves** **b) Wave Optics** **Unit-II** **a) Interference** **b) Interferometer** **Unit-III** **a) Diffraction** **b) Fraunhofr diffraction** **c) Fresnel Diffraction.** **Unit-IV** **Maxwell Equations** **Unit-V** **EM Wave Propagation in Unbounded Media** **Unit-VI** **a) EM Wave in Bounded Media** **b) Polarization of Electromagnetic Waves**	**08** **12** **12** **08** **06** **14**	**NH** **PB** **SB** **SM** **AH** **DPD**
PRACTICAL **PHY-M-P-4:** Marks (Semester End - 20, Internal	**WAVE OPTICS and ELECTROMAGNETIC THEORY**	1. To determine the frequency of an electric tuning fork by	**60**	**AH+SM+DPD**

Assessment – 5) (Lab. Note Book - 05, Viva-Voce-05, Experiment -10) Practical - (2 Credits) No. of Lectures - 60		Melde's experiment and verify *X2* -T law. 2. Familiarization with: Schuster's focusing; determination of angle of prism and to determine refractive index of the Material of a prism using sodium source. 3. To draw the deviation - wavelength of the material of a prism and to find the wavelength of an unknown line from its deviation. 4. To determine wavelength of (1) Na source and (2) spectral lines of suitable source using plane diffraction grating. 5. To determine the dispersive power of the material of a prism using mercury source. 6. To determine wavelength of sodium light using Fresnel Bi-prism. 7. To determine wavelength of sodium light using Newton's Rings. 8. To determine the thickness of a thin paper by measuring the		

		width of the interference fringes produced by a wedge-shaped Film. 9. To determine dispersive power and resolving power of a plane diffraction grating. 10. To verify the law of Malus for plane polarized light. 11. To determine the specific rotation of sugar solution using Polarimeter. 12. To determine the refractive index of liquid by total internal reflection using Wollaston's air-film.		
Theory **PHY-M-T-5:** Marks (Semester End – 40, Internal Assessment – 10) Internal Assessment [(Class Test/ Assignment/ etc) - 10] Theory: (4 Credits) No. of Lectures - 60	**THERMAL PHYSICS**	Unit-I-: Introduction to Thermodynamics Unit-II- Second Law of Thermodynamics Unit-III Entropy Unit-IV Thermodynamic Potentials Unit-V a) Maxwell's Thermodynamic Relations b) Kinetic Theory of Gases Distribution of Velocities Unit-VI a) Molecular Collisions b) Real Gases:	**08** **10** **07** **07** **14** **14**	**PB** **AH** **AH** **SB** **SM** **DPD**

		Behavior of Real Gases		

PRACTICAL **PHY-M-P-5:** Marks (Semester End - 20, Internal Assessment – 5) (Lab. Note Book - 05, Viva-Voce-05, Experiment -10) Practical - (2 Credits) No. of Lectures - 60	**THERMAL PHYSICS**	**1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.** **2. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.** **3. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.** **4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.** **5. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).** **6. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.** **7. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method,** **8. (2) Direct measurement using Op-Amp difference amplifier and to**	**60**	**PB+SB+NH**

		determine Neutral Temperature **9. Determination of the boiling point of a liquid by Platinum resistance thermometer** **10. Determination of the melting point of a solid with a thermocouple.** **11. Measurement of the coefficient of linear expansion of a solid using an optical lever.**		

Minor

courses	Courses Title	Topic	No. of Lectures	Teachers
Theory **PHY- MI-T-4:** **(3 Credits) No. of Classes - 45** **Marks (Semester End - 30, Internal Assessment – 05)**	**PHY- MI-T-4: ELECTRICITY AND MAGNETISM Theory: (3 Credits) No. of Classes - 45 Marks (Semester End - 30, Internal Assessment – 05)**	**Unit-I** **Electrostatics** **Unit-II-** **Magnetism** **Unit-III-** **A) Electromagnetic Induction** **B)Maxwell's equations and Electromagnetic wave propagation**	**14** **10** **06** **16**	**NH** **SB** **AH**
Practical **PHY-MI-P-4: ELECTRICITY AND MAGNETISM Practical - (1 Credits) No. of Classes- 30 Marks: (Semester End – 10, Internal Assessment – 05)**	**PHY- MI-T-4: ELECTRICITY AND MAGNETISM**	1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses. 2. Ballistic Galvanometen (i) Measurement of	**30**	**AH+PB+SB**

		charge and current sensitivity, (ii) Measurement of CDR, (iii) Determine a high resistance by Leakage Method, (iv) To determine Self Inductance of a Coil by Rayleigh's Method. 3.To compare capacitances using De'Sauty's bridge. 4.Measurement of field strength Bandits variation in a Solenoid (Determined B/dx) 5.To study the Characteristics of a Series RC Circuit. 6.To study a series LCR circuit LCR circuit and determine its (a) Resonant frequency, (b) Quality factor 7.To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q 8.To determine a Low Resistance by Carey Foster's Bridge. 9.To verify the Thevenin and Norton theorems 10.To verify the Superposition, and		

		Maximum Power Transfer Theorems 11.Verification of Ohm's law with a tangent galvanometer. 12.Determination of the end corrections of a metre bridge and to measure the value of an unknown resistance incorporating end corrections .		

SEM-VI(HONS)

courses	Courses Title	Topic	No. of Lectures	Teachers
PHY-H-CC-T-13: (Credits: Theory-04, Practicals-02) Theory: 60 Lectures F.M. = 75(Theory - 40, Internal Assessment – 15) Internal Assessment: Class Attendance (Theory) – 05, Theory (Class Test/ Assignment/ Tutorial) – 05, Practical (Sessional Viva-voce) - 05]	**Electromagnetic Theory**	**Unit-I** a) Maxwell Equation b) Rotatory Polarization **Unit-II** a) EM Wave in Bounded Media b) Polarization of Electromagnetic Waves **Unit-III** a) EM Wave Propagation in Unbounded Media **Unit-IV** a) Wave Guides b) Optical Fibres	**17** **22** **10** **11**	**DPD** **SM** **NH** **SB**
PHY-H-CC-P-13: QUANTUM MECHANICS AND APPLICATIONS Practical – 20 marks (Lab. Note Book – 05, Viva-Voce- 05,Experiment -10)	**Electromagnetic Theory**	1. To verify the law of Malus for plane polarized light. 2. To determine the specific rotation of sugar solution using Polarimeter. 3. To analyze elliptically	**60**	**SM+AH+DPD**

		polarized Light by using a Babinet's compensator. 4. To study dependence of radiation on angle for a simple Dipole antenna. 5. To determine the wavelength and velocity of ultrasonic waves in a liquid (Kerosene Oil, Xylene, etc.) by studying the diffraction through ultrasonic grating. 6. To study the reflection, refraction of microwaves 7. To study Polarization and double slit interference in microwaves. 8. To determine the refractive index of liquid by total internal reflection using Wollaston's air-film. 9. To determine the refractive Index of (1) glass and (2) a liquid by total internal reflection using a Gaussian eyepiece.45 10. To study the polarization of light by reflection and determine the polarizing angle for air-glass interface. 11. To verify the Stefan's law of radiation and to determine Stefan's constant. 12. To determine the		

		Boltzmann constant using V-I characteristics of PN junction diode. 13. To verify Brewster's law and Fresnel formulae for reflection of electromagnetic waves with the help of a spectrometer, a prism and two polaroids		
Theory PHY-H-CC-T-14 (Credits: Theory-04, Practicals-02) Theory: 60 Lectures F.M. = 75(Theory - 40, Internal Assessment – 15) Internal Assessment : Class Attendance (Theory) – 05, Theory (Class Test/ Assignment/ Tutorial) – 05, Practical (Sessional Viva-voce) - 05]	**STATISTICAL MECHANICS**	**Unit-I** **Classical Statistics** **Unit-II** A) Classical Theory of radiation B) Quantum theory of Radiation **Unit-III** A) Bose-Einstein Statistics B) Fermi-Dirac Statistics	**18** **14** **28**	**SB** **PB** **AH**
PHY-H-CC-P-14: Practical – 20 marks (Lab. Note Book – 05, Viva-Voce-05,Experiment -10)	**STATISTICAL MECHANICS**	1. Plot Planck's law for Black Body radiation and compare it with Wein's Law and Raleigh-Jeans Law at high temperature (room temperature) and low temperature. 2. Plot Specific Heat of Solids by comparing (a) Dulong-Petit law, (b) Einstein distribution function, (c) Debye distribution function for high temperature (room temperature) and low	**60**	**SM+PB**

		temperature and compare them for these two cases 3. Plot Maxwell-Boltzmann distribution function versus temperature. 4. Plot Fermi-Dirac distribution function versus temperature. 5. Plot Bose-Einstein distribution function versus temperature.		
PHY-H-DSE-T-03: (Credits: Theory-05, Tutorials-01) Theory: 75 Lectures F.M. = 75 (Theory - 60, Internal Assessment – 15) Internal Assessment [Class Attendance – 05, Class Test/ Assignment/ Tutorial – 10]	**NANO MATERIALS AND APPLICATIO-NS**	**Unit-I** a) Nanoscale Systems b) Characterization **Unit-II** A) Synthesis of nanostructure Materials B) Electron Transport **Unit-III** A) Optical Propertes B) Applications	**18** **14** **28**	**DPD** **SM** **PB**
PHY-H-DSE-T-04: (Credits: Theory-05, Tutorials-01) Theory: 75 Lectures F.M. = 75 (Theory - 60, Internal Assessment – 15) Internal Assessment [Class Attendance – 05, Class Test/ Assignment/ Tutorial – 10]	**EXPERIMENT-AL TECHNIQUES**	**Unit-I** a) Measurements b) Shielding and Grounding c) Digital Multimeter **Unit-II** **A)** Signals and Systems **B)** Impedance Bridges And Q-meter **Unit-III** Transducers & industrial instrumentation **Unit-IV** Vacuum Systems	**16** **11** **21** **12**	**SB** **PB** **DPD** **SM**

SEM-VI(PCC)

courses	Courses Title	Topic	No. of Lectures	Teachers
PHY-G-DSE-T-02: (Credits: Theory-04, Practicals-02) **F.M. = 75 (Theory - 40, Practical – 20, Internal Assessment – 15)** **Internal Assessment [Class Attendance (Theory) – 05, Theory (Class Test/ Assignment/ Tutorial) – 05, Practical (Sessional Viva-voce) - 05]**	**DIGITAL, ANALOG CIRCUITS AND INSTRUMENTATION**	**Unit-I** a) Digital Circuits b) Semiconductor Devices and Amplifiers **Unit-II** a) Operational Amplifiers b) Sinusoidal Oscillators c) Instrumentations	**30** **30**	NH PB
PHY-G-SEC-T-4 (Credits: 02) F.M. = 50 (Theory - 40, Internal Assessment – 10) Internal Assessment [Class Attendance	**Radiation Safety**	**Unit-I** a) Basics of atomic and nuclear physics b) Interaction of Radiation with matter **Unit-II** a) Radiation detection b) Radiation safety management c) Application of nuclear techniques	**13** **17**	**AH** **SM**

Academic Calendar
Department of Mathematics
Session: January-June, 2025

Semester: II, Mathematics Major (NEP)

Courses	Course Title	Topic	Concern Teacher	Number of Lecture
MATH-M-T-02	Algebra-I Major Course: Credit-6, Full Marks-75	Unit-I, Classical Algebra,	PM	30L
	Algebra-I Major Course: Credit-6, Full Marks-75	Unit-2, Abstract Algebra,	ARM	25L
	Algebra-I, Major Course: Credit-6, Full Marks-75	Unit-3, Linear Algebra,	SKB	20L
MATH-M-SEC-02	Fuzzy Set Theory Skill Enhancement Course, Credit-3, Full Marks-45.	Unit-1, Unit-2, Unit-3	UA UA UA	20L 15L 10L

Semester: II, Mathematics Minor (NEP)

Courses	Course Title	Topic	Concern Teacher	Number of Lecture
MATH-MI-T-01	Algebra & Analytical Geometry. Minor Course: Credit-4, Full Marks-50	Unit- I Algebra: Complex Number, Polynomials, Rank of Matrix, Relations and Partitions, Group, Subgroups.	SKB	20L
MATH-MI-T-01	Algebra & Analytical Geometry. Minor Course: Credit-4, Full Marks-50	Unit-II Analytical Geometry: Transformation of rectangular axes, General equations of second degree in x and y, Pair of straight lines, polar equation of straight lines and circles. Sphere and cone.	PM	30L

Semester: IV, Mathematics Major (NEP)

Courses	Course Title	Topic	Concern Teacher	Number of Lecture
MATH-M-T-04	Differential Equations (DE) Major Course: Credit-6, Full Marks-75	Unit-I: DE and mathematical model. G.S. of DE, Exact DE, LDE, First order and Higher degree DE. Unit-2: Lipschitz condition, GS of homogeneous equation second order. Method of undetermined coefficients and variation of parameters. Unit-3: System of LDE, Types of linear equations, Differential Operators. Basic Theory of linear systems in normal form, Homogeneous linear systems with constant coefficients. Unit-4: Equilibrium points, Interpretation of the phase plane. Power series solution.	PM	55L
	Differential Equations	Unit-5, PDE	UA	15L
MATH-M-T-05	Algebra-II Major Course: Credit-6, Full Marks-75	Unit-1, Abstract Algebra: Cosets, Normal subgroups, Factors groups. Unit-2, Abstract Algebra: Properties of external direct products, Fundamental theorem of abelian groups, Sylow's theorem, Cauchy's theorem Unit-3, Ring Theory	ARM ARM ARM	20L 10L 15L
	Algebra-II Major Course: Credit-6, Full Marks-75	Unit-4, Linear Algebra, Vector space Unit-5, Linear Algebra, Linear Transformation	SKB SKB	15L 15L

Semester: IV, Mathematics Minor(NEP)

Courses	Course Title	Topic	Concern Teacher	Number of Lecture
MATH-MI-T-02	Calculus & Differential Equations , Minor Course: Credit-4, Full Marks-50	Unit-I , Differential Calculus Unit-I , Integral Calculus	ARM ARM	25L 5L
		Unit-3, Differential Equations	PM	20L

Semester: VI, Mathematics Honours (CBCS)

Semester-VI (CBCS)

Courses	Course Title	Topic	Concern Teacher	Number of Lecture
MATH-CC-T-13 Core Course; Credit-6, Full Marks-75	Metric Spaces and Complex Analysis	Unit-2, Continuous mapping, compactness Unit-3, Complex functions, limit, continuity. Unit-4, Complex integration, power series	ARM ARM ARM	15L 20L 20L
MATH-CC-T-13		Unit-1 Metric Spaces sequences in metric spaces	PM	20L
MATH-CC-T-14 Core Course; Credit-6, Full Marks-75	Probability & Statistics	Unit-1, Probability , sample space, probability distribution function mathematical expectation Unit-2, Joint cumulative distribution function, Expectation of function of two random variables. Unit-3, Chebyshev's inequality, central limit theorem.	SKB SKB SKB	20L 20L 15L
MATH-CC-T-14		Unit-4, Statistics	PM	20L
MATH-H-DSE-T-3A, Discipline Specific Elective Course; Credit-6, Full marks-75	Fuzzy Set Theory	Unit-1, Interval numbers Unit-2 Fuzzy versus crisps sets, representation of fuzzy sets. Unit-3, Types of fuzzy operations, combinations of fuzzy operations. Unit-4, Crisp versus fuzzy relations, fuzzy binary relations. Unit-5, Fuzzy number and fuzzy equations	UA UA UA UA UA	5L 20L 30L 10L 10L

MATH-H-DSE-T-4A Discipline Specific Elective Course; Credit-6, Full marks-75	Point Set Topology	Unit-1, Topological spaces Unit-2, Subspaces Topology, Net in topological space. Unit-3 Separation axioms Unit-4, Connected spaces, properties of real valued continuous function on connected and compact spaces.	UA UA UA UA	20L 15L 15L 25L

Semester: VI, Mathematics General(CBCS)

Courses	Course Title	Topic	Concern Teacher	Number of Lecture
MATH-G-DSE-T-2B Discipline Specific Elective Course; Credit-6, Full marks-75	Numerical Method	Unit-I, Different typyes of error Unit-2 Numerical integration Unit-3 Transcendental and polynomial equations	SKB SKB SKB	20L 20L 20L
	Numerical Method	Unit-4, Numerical Method	ARM	15L
MATH-G-SEC-T-4A, Skill Enhancement course, Credit-2, Full marks-50	Programming in C	Unit-1, 2 Programming in C	PM	25L

SRIPAT SINGH COLLEGE

ACADEMIC CALENDAR SESSION- January, 2025 – June 2025
Stream: Science

DISTRIBUTION OF COURSES IN SEMESTER-II, IV & VI: January, 2025 – June 2025
Department of Chemistry
B. Sc. (Hons.)

DISTRIBUTION OF COURSES IN SEMESTER-II (NEP)

Courses	Course Title	Topic	No. of Lectures (Inclusion of Tutorials)	Teachers
Course Code: CHEM-MAT-2 **Course Title: Organic** [60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)	**Organic-1**	**Bonding and Physical Properties: Valence Bond Theory: Concept of hybridisation, shapes of molecules, resonance (including hyperconjugation); calculation of formal charges and double bond equivalent (DBE); orbital pictures of bonding (sp3, sp2, sp: C-C, C-N & C-O systems and s-cis and s-trans geometry for suitable cases). Electronic displacements:Inductive effect, field effect, mesomeric effect, resonance energy; bond polarization and bond polarizability; electromeric effect; steric effect,steric inhibition of resonance.**	18L	MM
	Organic-1	**MO theory:** **Qualitative idea about molecular orbitals, bonding and antibonding interactions, idea about σ, σ*, π, π*, n – MOs; basic idea about Frontier MOs (FMO); concept of HOMO, LUMO and SOMO;interpretation of chemical reactivity in terms of FMO interactions; sketch and energy levels of π MOs of i) acyclic p orbital system (C=C, conjugated diene, triene, allyl and pentadienyl systems), ii) cyclic p orbital system (neutral systems: [4], [6]-annulenes; charged systems: 3-, 4-, 5-membered ring systems); Hückel's rules for aromaticity up to [10]-annulene (including mononuclear heterocyclic compounds up to 6-membered ring); concept of antiaromaticity and homoaromaticity; non-aromatic molecules; Frost diagram; elementary idea about α and β; measurement of delocalization energies in terms of β for buta-1,3-diene, cyclobutadiene, hexa-1,3,5-triene and benzene.** **Physical properties:** **Influence of hybridization on bond properties: bond dissociation energy**	15L	MM

		(BDE) and bond energy; bond distances, bond angles; concept of bond angle strain (Baeyer's strain theory); melting point/boiling point and solubility of common organic compounds in terms of covalent & noncovalent intermolecular forces; polarity of molecules and dipole moments; relative stabilities of isomeric hydrocarbons in terms of heat of hydrogenation, heat of combustion and heat of formation.		
		General Treatment of Reaction Mechanism – I *Mechanistic classification:* Ionic, radical and pericyclic (definition and example); reaction type: addition, elimination and substitution reactions (definition and example); nature of bond cleavage and bond formation: homolytic and heterolytic bond fission, homogenic and heterogenic bond formation; curly arrow rules in representation of mechanistic steps; reagent type: electrophiles and nucleophiles (elementary idea); electrophilicity and nucleophilicity in terms of FMO approach. *Reactive intermediates:* Carbocations (carbenium and carbonium ions), carbanions, carbon radicals, carbenes, benzyne, nitrenes: generation and stability, structure using orbital picture and electrophilic/nucleophilic	24 L	MM
		Stereochemistry-I: *Bonding geometries of carbon compounds and representation of molecules:* Tetrahedral nature of carbon and concept of asymmetry; Fischer, sawhorse, flying-wedge and Newman projection formulae and their inter translations. *Concept of chirality and symmetry:* Symmetry elements and point groups (C_{nh}, C_{nv}, C_n, D_{nh}, D_{nd}, D_n, S_n (C_s, C_i); molecular chirality and centre of chirality; asymmetric and dissymmetric molecules; enantiomers and diastereomers; concept of epimers; concept of stereogenicity, chirotopicity and pseudoasymmetry; chiral centres and number of stereoisomerism: systems involving 1/2/3-chiral centre(s) (AA, AB, ABA and ABC types). *Relative and absolute configuration:* D/L and R/S descriptors; erythro/threo and meso nomenclature of compounds; syn/anti nomenclatures for aldols; E/Z descriptors for C=C, conjugated diene, triene, C=N and N=N	18 L	MTM RG

		systems; combination of R/S- and E/Z-isomerisms. *Optical activity of chiral compounds:* Optical rotation, specific rotation and molar rotation; racemic compounds, racemisation (through cationic, anionic, radical intermediates and through reversible formation of stable achiral intermediates); resolution of acids, bases and alcohols via diastereomeric salt formation; optical purity and enantiomeric excess; invertomerism of chiral trialkylamines.		
Course Code: CHEM-MAP-2 [2 credits = 20] Practical. Full Marks: 20	**Course Title: Organic-1**	**Separation:** Based upon solubility, by using common laboratory reagents like water (cold, hot), dil. HCl, dil. NaOH, dil. $NaHCO_3$, etc., of components of a binary solid mixture; purification of any one of the, separated components by crystallization and determination of its melting point. The composition of the mixture may be of the following types: Benzoic acid/p-Toluidine; p-Nitrobenzoic acid/p- Aminobenzoic acid; p-Nitrotolune/p-Anisidine; etc. Determination of boiling point: Determination of boiling point of common organic liquid compounds e.g., ethanol, cyclohexane, chloroform, ethyl methyl ketone, cyclohexanone, acetylacetone, anisole, crotonaldehyde, mesityl oxide, etc. [Boiling point of the chosen organic compounds should preferably be less than 160°C] Identification of a Pure Organic Compound by chemical test(s): Solid compounds: Oxalic acid, tartaric acid, citric acid, succinic acid, resorcinol, urea, glucose, benzoic acid and salicylic acid. Liquid Compounds: Formic acid, acetic acid, methyl alcohol, ethyl alcohol, acetone, aniline, N,N-dimethylaniline, benzaldehydeand nitrobenzene.	**10L**	MM MTM
CHEM-MDC-2 [60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)	**Basic Industrial Chemistry (Multidisciplinary Course)**	**Fuels** Classification of fuel; heating values; origin of coal, carbonization of coal, coal gas, producer gas, water gas, coal based chemicals; origin and composition of petroleum, petroleum refining,cracking, knocking, octane number, antiknock compounds, kerosene, liquefied petroleum gas(LPG), liquefied natural gas (LNG); petrochemicals (C1 to C3 compounds and their uses).	**9L**	AKK

		Fertilizers Manufacture of ammonia and ammonium salts, urea, superphosphate, bio-fertilizers. **3. Cement** Portland cement: composition and setting of cement, white cement. **4. Polymers** Basic concept, structure and types of plastics, polythene, polystyrene, phenol-formaldehydes,PVC; manufacture, physical properties and uses of natural rubber, synthetic rubber, siliconerubber; synthetic fibres, nylon-66, polyester, terylene, rayon; foaming agents, plasticizers andstabilizers. **1. Paints and varnishes** Primary constituents; formulation of paints; binders and solvents for paints; oil based paints, latexpaints, alkyd resin paint. Constituents of varnishes; formulation of varnishes. **6. Dyes and pigments** Basic idea on dyes and pigments, Natural and synthetic dyes, Ideas on some dyes such as methyl Orange, congo red, malachite green, crystal violet.	**(5L)** **(9L)** **(9L)**	AKK MH RG
CHEM-SEC-2 [60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)	**IT Skills for Chemist**	**1. Mathematics** i. Fundamentals, mathematical functions, polynomial expressions, logarithms, the exponential function, units of a measurement, interconversion of units, constants and variables, equation of a straight line, plotting graphs. ii. Uncertainty in experimental techniques: Displaying uncertainties, measurements in chemistry, decimal places, significant figures, combining quantities. iii. Uncertainty in measurement: types of uncertainties, combining uncertainties. Statistical treatment. Mean, standard deviation, relative error. Data reduction and the propagation of errors. Graphical and numerical data reduction. Numerical curve fitting: the method of least squares**(**regression). iv. Algebraic operations on real scalar variables (e.g. manipulation of van der Waals equation in different forms). Roots of quadratic equations analytically and iteratively (e.g. pH of a weak acid). Numerical methods of finding roots (Newton-Raphson, binary –bisection, e.g. pH of a weak acid not ignoring the ionization of water, volume of a van der Waals gas, equilibrium constant expressions). v. Differential calculus: The tangent line and the derivative of a function, numerical differentiation (e.g., change in pressure for small change in	**(15L)**	AR

		volume of a van der Waals gas, potentiometric titrations). vi. Numerical integration (Trapezoidal and Simpson's rule, e.g. entropy/enthalpy change from heat capacity data). **2. Computer programming** Constants, variables, bits, bytes, binary and ASCII formats, arithmetic expressions, hierarchy of operations, inbuilt functions. Elements of the BASIC language. BASIC keywords and commands. Logical and relative operators. Strings and graphics. Compiled versus interpreted languages. Debugging. Simple programs using these concepts. Matrix addition and multiplication. Statistical analysis. BASIC programs for curve fitting, numerical differentiation and integration (Trapezoidal rule, Simpson's rule), finding roots (quadratic formula, iterative, Newton-Raphson method). **3. Hands On** i. Introductory writing activities: Introduction to word processor and structure drawing (ChemSketch) software. Incorporating chemical structures, chemical equations, and expressions from chemistry (e.g. Maxwell-Boltzmann distribution law, Bragg's law, van der Waals equation, etc.) into word processing documents. ii. Handling numeric data: Spreadsheet software (Excel), creating a spreadsheet, entering and formatting information, basic functions and formulae, creating charts, tables and graphs. Incorporating tables and graphs into word processing documents. Simple calculations, plotting graphs using a spreadsheet (Planck's distribution law, radial distribution curves for hydrogenic orbitals, gas kinetic theory- Maxwell-Boltzmann distribution curves as function of temperature and molecular weight), spectral data, pressure-volume curves of van der Waals gas (van der Waals isotherms), data from phase equilibria studies. Graphical solution of equations. iii. Numeric modelling: Simulation of pH metric titration curves. Excel functions LINEST and Least Squares. Numerical curve fitting, linear regression (rate constants from concentration- time data, molar extinction coefficients from absorbance data), numerical differentiation (e.g. handling data from potentiometric and pH metric titrations, pKa of weak acid), integration (e.g.entropy/enthalpy change from heat capacity data). iv. Statistical analysis: Gaussian distribution	**(15L)** **(15L)**	MH AR

		and Errors in measurements and their effect on data sets. Descriptive statistics using Excel. Statistical significance testing: The t test. The F test. v. Presentation: Presentation graphics		
CHEM-MIT-2A (Minor-2) [60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)	**Course Title:** **Inorganic-1** **&** **Organic-1**	**Atomic Structure** Bohr's theory for hydrogen atom (simple mathematical treatment), atomic spectra of hydrogen and Bohr's model, Sommerfeld's model, quantum numbers and their significance, Pauli's exclusion principle, Hund's rule, electronic configuration of many-electron atoms, Aufbau principle and its limitations. **2. Chemical Periodicity** Classification of elements on the basis of electronic configuration: general characteristics of s-, p-, d- and f-block elements. Positions of hydrogen and noble gases in the periodic table. Atomic and ionic radii, ionization potential, electron affinity, and electronegativity; periodic and group-wise variation of above properties in respect of s- and p- block elements. **3.** Acids and bases Brönsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases, effects of substituent and solvent, differentiating and levelling solvents. Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept and solvent system concept. Hard and soft acids and bases (HSAB concept), applications of HSAB process. **4.** Redox reactions Balancing of equations by oxidation number and ion-electron method, Standard electrode potential,formal potential, redox indicator and redox titrations. **Fundamentals of Organic Chemistry** Electronic displacements: Inductive effect, resonance and hyperconjugation; cleavage of bonds: homolytic and heterolytic; structure of organic molecules on the basis of VBT; nucleophiles and electrophiles; reactive intermediates: carbocations, carbanions and free radicals. 2. Stereochemistry Different types of isomerism; geometrical and optical isomerism; concept of chirality and optical	**(6L)** **(6L)** **(6L)** **(4L)** **(5L)**	MH AKK RG MM MTM

		activity (up to two carbon atoms); asymmetric carbon atom; elements of symmetry (plane and centre); interconversion of Fischer and Newman representations; enantiomerism and diastereomerism, meso compounds; threo and erythro, D and L, cis and trans nomenclature; CIP Rules: R/S (upto 2 chiral carbon atoms) and E/Z nomenclature. 3. Nucleophilic Substitution and Elimination Reactions Nucleophilic substitutions: SN1 and SN2 reactions; eliminations: E1 and E2 reactions (elementary mechanistic aspects); Saytzeff and Hofmann eliminations; elimination vs substitution. 4. Aliphatic Hydrocarbons Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structures. Alkanes (up to 5 Carbons): Preparation: catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: mechanism for free radical substitution: halogenation. Alkenes: (up to 5 Carbons): Preparation: elimination reactions: dehydration of alcohols and dehydrohalogenation of alkyl halides; cis alkenes (partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alkaline KMnO4) and trans-addition (bromine) with mechanism, addition of HX [Markownikoff's (with mechanism) and anti-Markownikoff's addition], hydration, ozonolysis, oxymercuration-demercuration and hydroboration-oxidation reaction. Alkynes: (up to 5 Carbons): Preparation: acetylene from CaC2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation with hot alkaline KMnO4.	(5L) (4L) (9L)	MM MH
CHEM-MIP-2A (Minor-2) [2 credits = 20] Practical.	**Inorganic-1** **&** **Organic-1**	**A. 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.** **2. Estimation of oxalic acid by titrating it with KMnO4.**		

Full Marks: 20		**3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.** **4. Estimation of Fe (II) ions by titrating it with K2Cr2O7.** **B. Qualitative Analysis of Single Solid Organic Compound(s)** **1. Detection of special elements (N, Cl, and S) in organic compounds.** **2. Solubility and Classification (solvents: H2O, dil. HCl, dil. NaOH, dil. NaHCO3)** **3. Detection of functional groups: Aromatic-NO2, Aromatic-NH2, -COOH, carbonyl (no distinction of –CHO and >C=O needed), phenolic -OH in solid organic compounds.**	(10L)	**MM+AKK**

DISTRIBUTION OF COURSES IN SEMESTER-IV [NEP]

Courses	Course Title	Topic	No. of Lectures (Inclusion of Tutorials)	Teachers
CHEM-MAT-4 [4 Credit] [60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)	**Organic-2**	**Stereochemistry-II:** **Chirality arising out of stereoaxis: Stereoisomerism of substituted cumulenes with even and odd number of double bonds; chiral axis in allenes, spiro compounds, alkylidenecycloalkanes and biphenyls; related configurational descriptors (Ra/Sa and P/M); atropisomerism; racemisation of chiral biphenyls; buttressing effect.** **Concept of prostereoisomerism: Prostereogenic centre; concept of pron-chirality: topicity of ligands and faces (elementary idea); pro-R/pro-S, pro-E/pro-Z and Re/Si descriptors; pro-r and pro-s descriptors of ligands on propseudoasymmetric centre. Conformation: Conformational nomenclature: eclipsed, staggered, gauche, syn and anti; dihedral angle, torsion angle; Klyne-Prelog terminology; P/M descriptors; energy barrier of rotation, concept of torsional and steric strains; relative stability of conformers on the basis of steric effect, dipole-dipole interaction and H-bonding; butane gauche**	**(14L)**	MTM

		interaction; conformational analysis of ethane, propane, n-butane, 2-methylbutane and 2,3-dimethylbutane; haloalkane, 1,2-dihaloalkanes and 1,2-diols (up to four carbons); 1,2-halohydrin; conformation of conjugated systems (s-cis and s-trans). **General Treatment of Reaction Mechanism II :** **Reaction thermodynamics: Free energy and equilibrium, enthalpy and entropy factor, calculation of enthalpy change via BDE, intermolecular & intramolecular reactions.** **Concept of organic acids and bases: Effect of structure, substituent and solvent on acidity and basicity; proton sponge; gas-phase acidity and basicity; comparison between nucleophlicity and basicity; HSAB principle; application of thermodynamic principles in acid-base equilibria.** **Tautomerism: Prototropy (keto-enol, nitro - aci-nitro, nitroso-oximino, diazo-amino and enamineimine systems); valence tautomerism and ring-chain tautomerism; composition of the equilibrium in different systems (simple carbonyl; 1,2- and 1,3-dicarbonyl systems, phenols and related systems), factors affecting keto-enol tautomerism; application of thermodynamic principles in tautomeric equilibria.** **Reaction kinetics: Rate constant and free energy of activation; concept of order and molecularity; free energy profiles for one-step, two-step and three-step reactions; catalyzed reactions: electrophilic and nucleophilic catalysis; kinetic control and thermodynamic control of reactions; isotope effect: primary and secondary kinetic isotopic effect (kH/kD); principle of microscopic reversibility; Hammond's postulate.** **3. Substitution and Elimination Reactions:** **Free-radical substitution reaction: Halogentaion of alkanes, mechanism (with evidence) and stereochemical features; reactivity-selectivity principle in the light of Hammond's postulate. Nucleophilic substitution reactions: Substitution at sp3 centre: mechanisms (with evidence), relative rates & stereochemical features: SN1, SN2, SN2', SN1' (allylic**	**(18L)**	MM RG

		rearrangement) and SNi; effects of solvent, substrate structure, leaving group and nucleophiles (including ambident nucleophiles, cyanide & nitrite); substitutions involving NGP; role of crown ethers and phase transfer catalysts; [systems: alkyl halides, allyl halides, benzyl halides, alcohols, ethers, epoxides]. Concept of aliphatic electrophilic substitution reactions (SE1, SE2, SEi). **Elimination reactions: E1, E2, E1cb and Ei (pyrolytic syn eliminations); formation of alkenes and alkynes; mechanisms (with evidence), reactivity, regioselectivity (Saytzeff/ Hofmann) and stereoselectivity; comparison between substitution and elimination; importance of Bredt's rule relating to the formation of C=C.**	**(28L)**	MM
CHEM-MAP-4 [2 credits = 20] Practical. Full Marks: 20	**Organic-2**	Organic Preparations: A. The following reactions are to be performed, noting the yield of the crude product: Nitration of aromatic compounds Condensation reactions Hydrolysis of amides/imides/esters Acetylation of phenols/aromatic amines Benzoylation of phenols/aromatic amines Side chain oxidation of aromatic compounds Diazo coupling reactions of aromatic amines Bromination of anilides using green approach (Bromate-Bromide method)Selective reduction of m-dinitrobenzene to m-nitroaniline Students must also calculate percentage yield, based upon isolated yield (crude) and theoretical yield. Purification of the crude product is to be made by crystallisation from water/alcohol, crystallization after charcoal treatment, or sublimation, whichever is applicable. C. Melting point of the purified product is to be noted.		MM MTM
CHEM-MAT-5 [**4 Credit]** [60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)		**Transport processes (20 L)** **Viscosity: General features of fluid flow (streamline flow and turbulent flow); Newton's equation, viscosity coefficient; Poiseuille's equation; Principle of determination of viscosity coefficient of liquids by falling sphere method; Temperature variation of viscosity of liquids and comparison with that of gases.** **Conductance and transport number: Ion**	(15L)	RG

	Physical-2	**conductance; Conductance and measurement of conductance, cell constant, specific conductance and molar conductance; Variation of specific and equivalent conductance with dilution for strong and weak electrolytes; Kohlrausch's law of independent migration of ions; Equivalent and molar conductance at infinite dilution and their determination for strong and weak electrolytes; Debye–Huckel theory of Ion atmosphere (qualitative)-asymmetric effect, relaxation effect and electrophoretic effect; Ostwald's dilution law; Ionic mobility; Few applications of conductance measurement; Conductometric titrations. Transport number, Principles of Hittorf's and Moving-boundary methods.** **Applications of Thermodynamics –I Partial properties and chemical potential: Chemical potential and activity, partial molar quantities, relation between chemical potential and Gibb's free energy and other thermodynamic state functions; variation of chemical potential (μ) with temperature and pressure; Gibbs-Duhem equation; fugacity and fugacity coefficient; Variation of thermodynamic functions for systems with variable composition; Equations of states for these systems, Change in G, S H and V during mixing for binary solutions.** **Chemical Equilibrium: Thermodynamic conditions for equilibrium, degree of advancement; Van't Hoff's reaction isotherm (deduction from chemical potential); Variation of free energy with degree of advancement; Equilibrium constant and standard Gibbs free energy change; Definitions of KP, KC and KX; Van't Hoff's reaction isobar and isochore from different standard states; Shifting of equilibrium due to change in external parameters e.g. temperature and pressure; variation of equilibrium constant on addition of inert gas; Le Chatelier's principle. Nernst's distribution law; Application-(finding out Keq using Nernst distribution law for KI+I2 KI3 and dimerization of benzoic acid). Chemical potential and other properties of ideal substances-pure and mixtures: Pure ideal gas: Its chemical potential and other thermodynamic functions and their changes during mixing; Chemical potential**	(30L) (20L)	AR AR

		of an ideal gas in an ideal gas mixture; Concept of standard states and choice of standard states of ideal gases. Condensed Phase: Chemical potential of pure solid and pure liquids, Ideal solution–Definition, Raoult's law; Mixing properties of ideal solutions, chemical potential of a component in an ideal solution; Choice of standard states of solids and liquids. **3. Foundations of Quantum Mechanics Advent of Quantum Mechanics: Wave-particle duality, light as particles: photoelectric and Compton effects; electrons as waves and the de Broglie hypothesis; Uncertainty relations (without proof). Wave function: Schrodinger time-independent equation; nature of the equation, acceptability conditions imposed on the wave functions and probability interpretations of wave function. Concept of Operators: Elementary concepts of operators, eigenfunctions and eigenvalues; Linear operators; Commutation of operators, commutator and uncertainty relation; Expectation value; Hermitian operator; Postulates of Quantum Mechanics. Particle in a box: Setting up of Schrodinger equation for one-dimensional box and its solution; Comparison with free particle eigenfunctions and eigenvalues. Wave functions of particle in a box (normalisation, orthogonality, probability distribution); Expectation values of x, x2, px and px and their significance in relation to the uncertainty principle; Extension of the problem to two and three dimensions and the concept of degenerate energy levels.**	**20 L**	RG
CHEM-MAP-5 [2 credits = 20] Practical. Full Marks: 20	**Physical-2**	**Determination of viscosity of unknown liquids (aqueous solution of glycerol and sugar) with respect to water.** **ii. Determination of partition coefficient for the distribution of I2 between water and CCl4.** **iii. Determination of Keq for KI + I2= KI3, using partition coefficient between water and CCl4.** **iv. Conductometric titration of an acid (strong, weak, monobasic, dibasic) against strong base.** **v. Study of saponification reaction conductometrically.**	12L	AR RG

		vi. Verification of Ostwald's dilution law and determination of Ka of weak acid.		
CHEM-MIT-2B **[4 Credit]** [60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)	**Physical-1 & Inorganic -2**	**1. Kinetic Theory of Gases and Real gases** **a. Concept of pressure and temperature; Collision of gas molecules; Collision diameter; Collision number and mean free path; Frequency of binary collisions (similar and different molecules); Rate of effusion** **b. Nature of distribution of velocities, Maxwell's distribution of speed and kinetic energy; Average velocity, root mean square velocity and most probable velocity; Principle of equipartition of energy and its application to calculate the classical limit of molar heat capacity of gases** **c. Deviation of gases from ideal behavior; compressibility factor; Boyle temperature; Andrew's and Amagat's plots; van der Waals equation and its features; its derivation and application in explaining real gas behaviour; Existence of critical state, Critical constants in terms of van derWaals constants; Law of corresponding states** **d. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity(qualitative treatment only)** **2. Liquids** **Definition of Surface tension, its dimension and principle of its determination using stalagmometer; Viscosity of a liquid and principle of determination of coefficient of viscosity using Ostwald viscometer; Effect of temperature on surface tension and coefficient of viscosity of** **a liquid (qualitative treatment only)** **3. Solids Forms of solids, crystal systems, unit cells, Bravais lattice types, Symmetry elements; Laws of**	(9L)	RG AR

		Crystallography - Law of constancy of interfacial angles, Law of rational indices; Miller indices of different planes and interplanar distance, Bragg's law; Structures of NaCl, KCl and CsCl treatment only); Defects in crystals; Glasses and liquid crystals.	*4L*	MTM
		4. Chemical Kinetics a. Introduction of qualitative rate law, order and molecularity; Extent of reaction; rate constants; Rates of First, second and nth order reactions and their Differential and integrated forms (with derivation); Pseudo first order reactions; Determination of order of a reaction by half-life and differential method; Opposing reactions, consecutive reactions and parallel reactions	*(4L)*	
		b. Temperature dependence of rate constant; Arrhenius equation, energy of activation; Collision theory; Lindemann theory of unimolecular reaction; outline of Transition Stat theory (classical treatment)		
		1. Chemical Bonding and Molecular Structure a. Ionic Bonding: General characteristics of ionic bonding. lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment.	*(5L)*	
		b. Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples from s and p block elements of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.	*(20L)*	
		c. MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals,		MM

		nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s- p mixing). **2. Coordination Chemistry** **a. Werner's coordination theory, Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6.** **b. Drawbacks of VBT. IUPAC system of nomenclature. Crystal Field Theory (CFT): Postulates of CFT, splitting of d-orbitals in octahedral and tetrahedral fields, Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Factors affecting the magnitude of □. Spectrochemical series. Comparison of CFSE for Oh and Td complexes.**	**(12L)**	**MH**
CHEM-MIP-2B [2 credits = 20] Practical. Full Marks: 20	**Physical-1 & Inorganic-2**	**1. Determination of the surface tension of a liquid or a dilute solution using a Stalagmometer** **2. Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer** **3. Study of the kinetics of acid hydrolysis of methyl acetate using hydrochloric acid.** **Inorganic-2** **Qualitative semi-micro analysis of mixtures containing three radicals. Emphasis should be given to the understanding of the chemistry of different reactions. Acid Radicals: Cl-, Br-, I-, NO2-, NO3-, S2-, SO42-, BO33-, H3BO3.Basic Radicals: K+, Ca2+, Sr2+, Ba2+, Cr3+, Mn2+, Fe3+, Ni2+, Cu2+, NH4+.**		

Courses	Course Title	Topic	No. of Lectures (Inclusion of Tutorials)	Teachers
CHEMHT-13 **[4 Credit]** **[60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)**	**Inorganic Chemistry – V**	**1. Molecular symmetry and Point group :** Symmetry as a universal theme, concept of symmetry elements and operations (with examples); symmetry properties of atomic orbitals (s, p and d); concept of point groups, identification of molecular point groups in some simple molecules m and ions; applications of symmetry for polarity and chirality. **2. Bio-inorganic Chemistry:** Essential elements of life, Role of metal ions in living systems- a brief review, Elementary idea about proteins, enzymes and ionophores; Structure of ATP, Na^+ ion pump and transport of Na^+ and K^+ across cell membrane; active site structures and bio-functions of haemoglobin, myoglobin, carboxy peptidase A, carbonic anhydrase B, cytochrome c, ferredoxins and chlorophyll; biological nitrogen fixation; toxic metals (Pb, Cd and Hg) and their effects, Wilson disease, chelation therapy; platinum and gold complexes as drugs (examples only). **3. Organometallic Chemistry and Catalysis :** Definition, Classification of organometallic compounds, hapticity of ligands, nomenclature, 16- electron & 18-electron rule and its applications; preparation and structure of mono- and bi-nuclear carbonyls of 3d series, synergic effect of CO and use of IR data to explain extent of back bonding; General methods of preparation of metal-carbon σ-bonded complexes, Zeise's salt, Metal-carbon multiple bonding; Preparation, structures, properties and reactions of ferrocene; elementary idea about oxidative addition, reductive elimination, insertion reactions; Study of the following catalytic processes: alkene hydrogenation (Wilkinson's catalyst), hydroformylation, Wacker process, Synthetic gasoline (Fischer Tropsch reaction) and Olefinpolymerization reaction (Ziegler-Natta catalyst)	**(10)** **(25)** **(25) L**	**AKK** **MH** **KKS**

Inorganic Chemistry – V [2 credits = 20] Practical. Full Marks: 20	**Inorganic Chemistry – V**	**Qualitative semimicro analysis** Qualitative semimicro analysis of mixtures containing four radicals (excluding oxide and carbonate). Emphasis should be given to the understanding of the chemistry of different reactions and to assign the most probable composition. Basic Radicals: $K+$, NH_4^+ , Mg^{2+}, Ca^{2+}, Ba^{2+}, Sr^{2+}, Al^{3+}, Cr^{3+}, Mn2+, Fe3+/ Fe2+, Co2+, Ni^{2+}, Cu^{2+}, Zn^{2+}, Pb^{2+}, Cd^{2+}, Bi^{3+}, Sn^{2+} / Sn^{4+}, As3+/As5+, Sb3+/ Sb5+ Acid Radicals: Cl^- , Br^- , I^- , S^{2-} , SO_4^{2-} , $S_2O_3^{2-}$, SCN^- , NO_3^- , NO_2^- , BO_3^{3-} , PO_4^{3-} , AsO_4^{3-} and H_3BO_3 Insoluble Materials: Cr_2O_3(ig), Fe_2O_3(ig), Al_2O_3, SnO_2, $PbSO_4$, $BaSO_4$, $SrSO_4$	12L	MH AKK
CHEMHT-14 **[4 Credit]** **[60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)**	**Organic Chemistry – V**	1. **Carbocycles and Heterocycles:** **Polynuclear hydrocarbons and their derivatives:** synthetic methods include Haworth, Bardhan-Sengupta, Bogert-Cook and other useful syntheses (with mechanistic details); fixation of double bonds and Fries rule; reactions (with mechanism) of naphthalene, anthracene, phenanthrene and their derivatives. **Heterocyclic compounds:** 5- and 6-membered rings with one heteroatom; reactivity, orientation and important reactions (with mechanism) of furan, pyrrole, thiophene and pyridine; synthesis (including retrosynthetic approach and mechanistic details): pyrrole: Knorr synthesis, Paal-Knorr synthesis, Hantzsch; furan: Paal-Knorr synthesis, Feist-Benary synthesis and its variation; thiophenes: Paal-Knorr synthesis, Hinsberg synthesis; pyridine: Hantzsch synthesis; benzo-fused 5- and 6-membered rings with one heteroatom: reactivity, orientation and important reactions (with mechanistic details) of indole, quinoline and isoquinoline; synthesis (including retrosynthetic approach and mechanistic details): indole: Fischer, Madelung and Reissert; quinoline: Skraup, Doebner- Miller, Friedlander; isoquinoline: Bischler-	**(16L)**	**MTM**

		Napieralski synthesis. 2. **Cyclic Stereochemistry: Alicyclic compounds:** concept of I-strain; conformational analysis: cyclohexane, mono and disubstituted cyclohexane; symmetry properties and optical activity; topomerisation; ring-size and ease of cyclisation; conformation & reactivity in cyclohexane system: consideration of steric and stereoelectronic requirements; elimination (E2, E1), nucleophilic substitution (S_N1, S_N2, S_Ni, NGP), merged substitution-elimination; rearrangements; oxidation of cyclohexanol, esterification, saponification, lactonisation, epoxidation, pyrolytic syn elimination and fragmentation reactions. 3. **Pericyclic reactions: Mechanism, stereochemistry, regioselectivity in case of Electrocyclic reactions:** FMO approach involving 4π- and 6π-electrons (thermal and photochemical) and corresponding cycloreversion reactions. **Cycloaddition reactions:** FMO approach, Diels-Alder reaction, photochemical [2+2] cycloadditions. **Sigmatropic reactions:** FMO approach, sigmatropic shifts and their order; [1,3]- and [1,5]-H shifts and [3,3]-shifts with reference to Claisen and Cope rearrangements. 4. **Carbohydrates:** **Monosaccharides:** Aldoses up to 6 carbons; structure of D-glucose & Dfructose (configuration & conformation); ring structure of monosaccharides (furanose and pyranose forms): Haworth representations and non-planar conformations; anomeric effect (including stereoelectronic explanation); mutarotation; epimerization; reactions (mechanisms in relevant cases): Fischer glycosidation, osazone formation, bromine-water oxidation, HNO_3 oxidation, selective oxidation of	**(10L)** **(8L)**	**MM** **RG**

		terminal –CH_2OH of aldoses, reduction to alditols, Lobry de Bruyn-van Ekenstein rearrangement; stepping–up (Kiliani-Fischer method) and stepping–down (Ruff's & Wohl's methods) of aldoses; end-group-interchange of aldoses; acetonide (isopropylidene) and benzylidene protections; ring-size determination; Fischer's proof of configuration of (+)-glucose. **Disaccharides:** Glycosidic linkages, concept of glycosidic bond formation by glycosyl donor-acceptor; structure of sucrose, inversion of cane sugar. **Polysaccharides:** starch (structure and its use as an indicator in titrimetric analysis). 5. **Biomolecules:** **Amino acids:** synthesis with mechanistic details: Strecker, Gabriel, acetamido malonic ester, azlactone, Bücherer hydantoin synthesis, synthesis involving diketopiperazine; isoelectric point, zwitterions; electrophoresis, reaction (with mechanism): ninhydrin reaction, DakinWest reaction; resolution of racemic amino acids. **Peptides:** peptide linkage and its geometry; syntheses (with mechanistic details) of peptides using N-protection & C-protection, solid-phase (Merrifield) synthesis; peptide sequence: C-terminal and N-terminal unit determination (Edman, Sanger & 'dansyl' methods); partial hydrolysis; specific cleavage (enzymatic) of peptides: use of CNBr. **Nucleic acids:** pyrimidine and purine bases (only structure & nomenclature); nucleosides and nucleotides corresponding to DNA and RNA; mechanism for acid catalysed hydrolysis of nucleosides (both pyrimidine and purine types); comparison of alkaline hydrolysis of DNA and RNA; elementary idea of double helical structure of DNA (WatsonCrick model); complimentary base–pairing in DNA.	**(12L)** **(14L)**	**MM**
CHEMHP-14 [2 credits = 20]	**Organic Chemistry – V**	1. TLC separation of a mixture	**20L**	**MM**

Practical. Full Marks: 20		containing 2/3 amino acids 2. TLC separation of a mixture of dyes (fluorescein and methylene blue) 3. Column chromatographic separation of leaf pigments from spinach leaves 4. Column chromatographic separation of mixture of dyes 5. Paper chromatographic separation of a mixture containing 2/3 amino acids6. Paper chromatographic separation of a mixture containing 2/3 sugars **Spectroscopic Analysis of Organic Compounds:** 1. Assignment of labelled peaks in the 1H NMR spectra of the known organic compounds explaining the relative δ-values and splitting pattern. 2. Assignment of labelled peaks in the IR spectrum of the same compound explaining the relative frequencies of the absorptions (C-H, O-H, N-H, C-O, C-N, C-X, C=C, C=O, N=O, C≡C, C≡N stretching frequencies; characteristic bending vibrations are included). 3. The students must record full spectral analysis of at least 15 (fifteen) compounds from the following list: a. 4-Bromoacetanilide b. 2-Bromo-4'-methylacetophenone c. Vanillin d. 2-Methoxyacetophenone e. 4-Aminobenzoic acid f. Salicylamide g. 2-Hydroxyacetophenone h. 1,3-Dinitrobenzene i. Benzylacetate j. trans-4-Nitrocinnamaldehyde k. Diethyl fumarate		

		l. 4-Nitrobenzaldehyde m. 4-Methylacetanilide n. Mesityl oxide o. 2-Hydroxybenzaldehyde p. 4-Nitroaniline q. 2-Hydroxy-3-nitrobenzaldehyde r. 2,3-Dimethylbenzonitrile s. Pent-1-yn-3-ol t. 3-Nitrobenzaldehyde u. 3-Ethoxy-4-hydroxybenzaldehyde v. 2-Methoxybenzaldehyde w. Methyl 4-hydroxybenzoate x. Methyl 3-hydroxybenzoate y. 3-Aminobenzoic acid z. Ethyl 3-aminobenzoate aa. Ethyl 4-aminobenzoate bb. 3-nitroanisole cc. 5-Methyl-2-nitroanisole d. 3-Methylacetanilide		
CHEMHTDSE-3 **[4 Credit]** **[60 Classes] Full Marks: 55 (End Sem. 40+Internal Assessment 15)**	**Advanced Physical Chemistry**	1. **Crystal Structure** Bravais Lattice and Laws of Crystallography: Types of solid, Bragg's law of diffraction; Laws of crystallography (Haüy's law and Steno's law); Permissible symmetry axes in crystals; Lattice, space lattice, unit cell, crystal planes, Bravais lattice. Packing of uniform hard sphere, close packed arrangements (fcc and hcp). Crystal planes: Distance between consecutive planes [cubic, tetragonal and orthorhombic lattices]; Indexing of planes, Miller indices; calculation of dhkl; Relation between molar mass and unit cell dimension for cubic system; Bragg's law (derivation). Determination of crystal structure: Powder method; Structure of NaCl and KCl crystals. **2. Statistical Thermodynamics** Configuration: Macrostates, microstates and	20 L 18 L	**AR**

		configuration; variation of W with E; equilibrium configuration. Boltzmann distribution: Thermodynamic probability, entropy and probability, Boltzmann distribution formula (with derivation); Applications to barometric distribution; Partition function, concept of ensemble - canonical ensemble and grand canonical ensembles. Partition function: molecular partition function and thermodynamic properties. **3. Special selected topics** Specific heat of solid: Coefficient of thermal expansion, thermal compressibility of solids; Dulong –Petit's law; Perfect Crystal model, Einstein's theory – derivation from partition function, limitations. 3rd law: Absolute entropy, Plank's law, Calculation of entropy, Nernst heat theorem. Polymers: Classification of polymers, nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers; Criteria for synthetic polymer formation; Relationships between functionality, extent of reaction and degree of polymerization.	22 L	AR
CHEMHPDSE-3 [2 credits = 20] Practical. Full Marks: 20	**Advanced Physical Chemistry**	**Computer Programming based on numerical methods for:** i. Roots of equations: (e.g. volume of van der Waals gas and comparison with ideal gas, pH of a weak acid). ii. Numerical differentiation (e.g., change in pressure for small change in volume of a van der Waals gas, potentiometric titrations). iii. Numerical integration (e.g. entropy/ enthalpy change from heat capacity data), probability distributions (gas kinetic theory) and mean values. iv. Simple exercises using molecular visualization software.		AR
CHEMHTDSE-4 [4 credits] **Full Marks: 55 (End Sem. 40+Internal Assessment 15)**	**Project Work**	A dissertation has to be prepared on consultation with teachers/mentors on a topic from any area of Chemistry. During examination a thorough viva-voce will be conducted by the examiners/adjudicators. The dissertation will be evaluated on the basis of written documents submitted by the candidate, originality and importance.		MH AKK RG MTM MM AR

CHEMHPDSE-4 [2 credits] **Full Marks: 20**	**Project Work**	A power point presentation has to be prepared and a short oral presentation will be considered for continuous evaluation. A PDF file/print copy of the power point will be required to be submitted.		

DEPARTMENT OF BOTANY

SRIPAT SINGH COLLEGE

JIAGANJ, MURSHIDABAD

EVEN SEMESTER SYLLABUS DISTRIBUTON FOR THE SESSION 2024-25

2ND SEMESTER UNDER NEP

Course Code	Course Title	Name of the Course	Course Content	Assigned Teacher	No. of Lectures (inclusive of Tutorials)
BOT-MJ-CC-T-02	Biomolecules and Cell Biology	MAJOR (THEORY)	**Unit 1: Biomolecules** 1. Types and significance of chemical bonds; Structure and properties of water; pH and buffers. 2. Carbohydrates: Nomenclature and classification; Monosaccharides; Disaccharides; Oligosaccharides and Polysaccharides. 3. Lipids: Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacyl glycerol structure, functions and properties; Phosphoglycerides. 4. Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quaternary; Protein denaturation and biological roles of proteins. 5. Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of t RNA.	**SM**	(20)
			Unit 2: Bioenergetics	**RI**	(4)
			Unit 3: Enzymes Menten equation, enzyme inhibition and factor affecting enzyme activity.	**SM**	(6)

			Unit 4: The cell Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic Theory).	**DR**	(4)
			Unit 5: Cell wall and plasma membrane Chemistry, structure and function of plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis.	**RI**	(4)
			Unit 6: Cell organelles 1. Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecularorganization of chromatin; nucleolus. 2. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. 3. Chloroplast, Mitochondrion, and Peroxisome: Structural organization; Function; Semiautonomous nature of mitochondrion and chloroplast. 4. Endomembrane system: Endoplasmic Reticulum (ER) – Structure, targeting and insertion of protiens in the ER, protien folding, processing; Smooth ER and lipid synthesis, export of protiensand lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export fromGolgi Apparatus; Lysosome 5. Organelle without membranes: Ribosomes – structure and function	**RI (2,4,5), DR (1,3)**	(20)
			Unit 7: Cell division	**RI**	7

			Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.		
BOT-MJ--CC-P-02	**Biomolecules and Cell Biology**	**Major (Practical)**	1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins. 2. Study of plant cell structure with the help of epidermal peel mount of *Allium cepa/ Rhoeo/Crinum*. 3. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf. 4. Measurement of cell size by the technique of micrometry. 5. Counting the cells per unit volume using haemocytometer (Yeast/pollen grains). 6. Study of cell and its organelles with the help of electron micrographs. 7. Cytochemical staining of: DNA- Feulgen and cell wall in the epidermal peel of onion usingPeriodic Schiff's (PAS) staining technique (demonstration only). 8. Study the phenomenon of plasmolysis and deplasmolysis. 9. Study different stages of mitosis and meiosis.	**SM (1,5,8) RI (2,3,9) DR (4,6,7)**	60
BOT-SEC-T-02	**B: MEDICINAL BOTANY**	**THEORY**	**Unit 1:** History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope - Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-e-tabiya, tumors treatments/ therapy, polyherbal formulations.	**SM**	
			Unit 2: Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.	**RI**	
			Unit 3: Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. Folk	**DR**	

			medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, blood pressure and skin disease.		
BOT-SEC-P-02-A		**Practical**	Make a field report on the important medicinal plants (at least 10) used by local inhabitants.	**SM, RI, DR**	
BOT-MI-CC-T-01 (EITHER IN SEMESTER 1 OR 2)	**BIODIVERSITY OF MICROBES, ALGAE, FUNGI AND BRYOPHYTES**	**MINOR (THEORY)**	**Unit 1: Microbes** Virus- General structure, replication (general account), DNA virus (T-phage); Lytic and Lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria- General characteristics and cell structure; Reproduction- conjugation, transformation and transduction; Economic importance.	**BC**	10
			Unit 2: Algae General characteristics: reproduction; Classification of algae by Fritsch (1935); Economic importance of algae.	**BC**	12
			Unit 3: Fungi Introduction: General characteristics, cell wall composition, reproduction and classification (Alexopoulos, Mims and Blackwell 1996); Symbiotic associations- Lichens: General account; Mycorrhiza: ectomycorrhiza and endomycorrhiza.	**SY**	12

			Unit 4: Bryophyte General characteristics; adaptations to land habit; classification following Smith G.M. (1955); Economic importance of bryophytes with special mention of *Sphagnum*	**SY**	10
BOT–MI-CC-P-01 (EITHER IN SEMESTER 1 OR 2)		**MINOR (PRACTICAL)**	**1.EMs/Models of viruses** -T-Phage and TMV. **2. Types of Bacteria -**from temporary/permanent slides/photographs. **3. Gram staining.** **4. Algae- (Study from permanent slides/ permanent slide/preserved specimen)** -*Nostoc, Oedogonium, Chlamydomonas* and *Fucus* **5. Fungi- (Study from permanent slides/ permanent slide/preserved specimen)-** *Rhizopus* and *Penicillium*, *Agaricus* (Section of gills). **6. Lichens:** Study of growth forms of Lichens (crustose, foliose and fruticose). **7. Mycorrhiza**: ectomycorrhiza and endomycorrhiza (Photographs). **8. Bryophyte-(Study from permanent slides/ permanent slide/preserved specimen)-** *Marchantia* (morphology of thallus, VS of antheridiophore, archegoniophore), *Funaria (*morphology, LS of capsule).	**BC (1,2,3,4)** **SY (5,6,7,8)**	

4TH SEMESTER UNDER NEP

Course Code	Course Title	Name of the Course	Course Content	Assigned Teacher	No. of Lectures (inclusive of Tutorials)
BOT-MJ--CC-T-04	**BRYOPHYTES AND PTERIDOPHYTES**	**MAJOR (THEORY)**	**Unit 1: Classification of Bryophytes** Modern concepts in bryophyte classification with special reference to Shaw and Goffinet (2000).	**RI**	(20)
			Unit 2: Type Studies of Bryophyte Range of thallus organisation; Systematic position, morphology, anatomy and reproduction of *Riccia, Marchantia, Pellia, Anthoceros, Sphagnum* and *Funaria*.	**RI**	(4)
			Unit 3: Origin and Evolution of Bryophytes Origin of bryophytes; Origin of alternation of generation (Homologous and Antithetic theories); Evolution of sporophyte (Progressive and Regressive concepts). Evolutionary trends in *Riccia, Marchantia, Anthoceros* and *Funaria*.	**RI**	(6)

			Unit 4: Basic concepts of Pteridophytes Life cycle patterns of homosporous and heterosporous pteridophytes; Apospory and Apogamy; Habitat diversity.	**BC**	(4)
			Unit 5: Classification of Pteridophytes Classification of pteridophytes by Smith et. al. (2006) with diagnostic features and example.	**BC**	(4)
			Unit 6: Type Studies of Pteridophytes Systematic position, morphology, anatomy and reproduction of *Psilotum, Lycopodium, Selaginella, Equisetum, Ophioglossum, Pteris* and *Marsilea*.	**SM (***Lycopodiun, Selaginella, Equisetum, Pteris***)**	(20)
			Unit 7: Origin and Evolution of Pteridophytes Origin of pteridophytes; Telome concept in land plant evolution; Structural features, geological and geographical distributions and evolutionary trends in early land plants *Cooksonia, Rhynia, Lepidodendron* and *Calamites*	**BC**	7

BOT-MJ--CC-P-04	**BRYOPHYTES AND PTERIDOPHYTES**	**Major (Practical)**	**Unit 1.** Riccia Morphology of thallus. T.S. of thallus and sporophyte. **Unit 2.** Marchantia Morphology of thallus, whole mount of rhizoids and Scales, vertical section of thallus through Gemma cup (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte. **Unit 3.** Anthoceros Morphology of thallus, vertical section of thallus and sporophyte (permanent slide). **Unit 4.** Pellia Whole mount of thallus showing leaf arrangement and sporophyte (Permanent slides). **Unit 5.** Sphagnum Whole mount of leaf and sporophyte (L.S.) (permanent slides). **Unit 6.** Funaria Morphology, whole mount of plant (temporary slides); permanent slides showing longitudinal section of capsule. **Unit 7**. Psilotum Morphology, transverse section of synangium (permanent slide) **Unit 8**. Lycopodium Morphology, transverse section of stem, whole mount of sporophyll (temporary slides), longitudinal section of strobilus. **Unit 9**. Selaginella Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus. **Unit 10.** Equisetum Morphology, transverse section of node and internode, longitudinal section of strobilus, transverse section of strobilus. **Unit 11.** Pteris Morphology, transverse section of leaflet showing sporangium.	**SM (7-11)** **RI (1-6)**	60
BOT-MJ--CC-T-05	**GYMNOSPERM AND**	**MAJOR (THEORY)**	**Unit 1: Progymnosperms** Development of Progymnosperm concept; Diagnostic features of Progymnospermophyta.	**DR**	
			Unit 2: Classification	**DR**	

			Classification of gymnosperm by Gifford and Foster (1989) with diagnostic features and examples (from division Pteridospermophyta to Gnetophyta).		
			Unit 3: Type Studies of Gymnosperms Systematic position, vegetative and reproductive morphology of sporophyte, wood anatomy, development of gametophyte, and embryogeny of Cycas, Pinus, Ginkgo, Ephedra, Gnetum; Indian distribution of each taxa.	**DR**	
			Unit 4: Origin and Evolution of Gymnosperms Origin and evolution of seed habit; Structural features, geological and geographical distribution, evolutionary trends in reconstructed genera Lyginopteris, Williamsonia, Cordaites	**DR**	
			Unit 5: Introduction to Palaeobotany Definition of Palaeobotany and Fossil; Uses of fossils**.**	**SM**	
			Unit 6: Plant fossil & their age determination Rocks containing plant fossils; Environments for fossilization; Modes of preservation (after James M. Schopf, 1975); Perfection of preservation; Geological ages in time scale; Radiometric dating method for age determination of fossil with special reference to radiocarbon dating	**SM**	
			Unit 7: Study of plant fossil records Common form of evidences used in reconstruction of plant fossils with examples; Nomenclature of plant fossils and their problems; Appearance of major plant groups through geological ages as evidenced from plant fossil records.	**SM**	
			Unit 8: Evolutionary theories Mass extinction and the plant fossil record Evolutionary theories- Phyletic gradualism and Punctuated equilibrium; Patterns of evolutionary change in the plant fossil records; Definition of mass extinction and five big mass extinction events in Earth's history; Causes of no mass extinction in the plant fossil records.	**SM**	
			Unit 9: Gondwana land and plant fossil (Glossopteris) Concept of Gondwana land and their geological and geographical distributions; Brief idea of Glossopteris plant and its importance in establishing existence of Gondwana land; A brief account of three-fold classification of Indian Gondwana system and major mega-fossil assemblages.	**SM**	
BOT-MJ--CC-P-05	**GYMNOSPERM AND PALAEOBOTANY**	**Practical**	Unit 1: Gymnosperms ***Cycas***- T.S. of leaflet, morphology of microsporophyll and megasporophyll, L.s. of ovule. ***Pinus***- Transverse section of needle, longitudinal section of male cone, longitudinal section of female cone (permanent slide), study of pollen from permanent slide. ***Gnetum***- Longitudinal section of stem, vertical section of ovule (permanent slide). ***Ephedra***- Longitudinal section of stem, vertical section of ovule (permanent slide).	**DR**	

			Unit 2: Palaeobotany Study of external and internal morphology of fossils as representative of major plant groups through Page | 34 geological ages (Rhynia- t.s. of stem, *Lepidodendron*- t.s. of stem, *Calamites*- t.s. of stem, *Glossopteris* leaf, *Ptilophyllum*- leaf, *Cordaites*- leaf, *Lyginopteris*- t.s. of stem, *Williamsonia*- fructification, any angiosperm leaf (from available specimens or photographs)	**SM**	
BOT-MI-CC-T-02(THEORY)	**VASCULAR PLANTS, MORPHOLOGY & TAXONOMY OF ANGIOSPERMS**	**MINOR (THEORY)**	**Unit 1: Pteridophytes:** General characteristics; Early land plants (*Cooksonia* and *Rhynia*); Systematic position, morphology, anatomy and reproduction of *Lycopodium, Selaginella* and *Pteris* (developmental details not to be included); Heterospory and seed habit; Economical importance.	**SY**	4
			Unit 2: Gymnosperms: General characteristics; Systematic position, morphology, anatomy and reproduction of *Cycas* and *Pinus* (developmental details not to be included); Economic importance**.**	**SY**	3
			Unit 3: Morphology of Angiosperms: Types of leaves; phyllotaxy; types of inflorescence; morphology of flowers – types of flowers, aestivation, floral formula and floral diagram, adhesion and cohesion of floral parts, placentation types; types of fruits and seeds**.**	**BC**	5
			Unit 4: Introduction to angiosperm taxonomy: Identification, Classification, Nomenclature. Taxonomic hierarchy; Botanical nomenclature-Principles and rules (ICN); binominal system, typification, author citation; Types of classification - artificial, natural and phylogenetic. Outline of Bentham and Hooker (up to series) classification with merits and demerits. Salient features, Systematic position (Bentham & Hooker), economically important plants of the following families- Monocotyledon: Poaceae; Orchidaceae. Dicotyledon: Fabaceae (sensu stricto); Malvaceae; Solanaceae; Lamiaceae; Asteraceae. Functions of Herbarium, important herbaria and botanical gardens of India;	**BC**	13

BOT-MI-CC-P-02(PRACTICAL)		**MINOR (PRACTICAL)**	**1 Unit 1:** *Lycopodium*- morphology, WM of strobilus, (temporary slides), LS of strobilus (permanent slide). *Selaginella*- morphology, WM of strobilus, WM of microsporophyll and megasporophyll (temporary slides), LS of strobilus (permanent slide). *Pteris*- morphology, TS of leaflet.	**SY**	
			Unit 2: Megasporophyll of *Cycas* (from preserved specimen); pollen grain of *Pinus* (from permanent slide).	**SY**	
			Unit 3: Study of vegetative and floral characters of the following families of the available genera distributed locally according to Bentham and Hooker's system of classification: Dicotyledon: Fabaceae (*sensu stricto*); Malvaceae; Solanaceae; Lamiaceae; Asteraceae. Spot identification (Scientific name and Family) of common wild plants from families included in theory syllabus. Field visits (2 local) and submission of properly preserved herbarium specimens of at least 15 common wild plants with herbarium label, proper field record and field notes. The herbarium specimens should be submitted during end term examination.	**BC**	

6TH SEMESTER UNDER CBCS

HONOURS

Course Code	Course Title	Course Content	Teacher Assigned	No. Of Lectures (Inclusive Of Tutorials)
UG-H-BOT-CC-T-13	Genetics	Unit 1: Mendelian genetics and its extension Mendelism: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and dominant traits; Polygenic inheritance	**DR**	**10**
		Unit 2: Extrachromosomal inheritance Chloroplast mutation: Variegation in Four o'clock plant (Mirabilis jalapa); Maternal effectsshell coiling in snail; Infective heredity- Kappa particles in Paramecium.	**DR**	**5**
		Unit 3: Linkage, crossing over and chromosome mapping	**DR**	**5**

		Linkage and crossing over-Cytological basis of crossing over; Recombination frequency, two factor and three factor crosses; Three-point mapping; Interference and coincidence.		
		Unit 4: Chromosome and nucleic acids Physical and Chemical structure of chromosome; DNA packaging (Kornberg's Nucleosome Model); Structure of Nucleic acids - DNA, RNA; Types of DNA (A, B and Z); DNA replication: Evidence for semi-conservative replication (Messelson and Stahl); Mechanism of bidirectional replication in bacteria.	**SM**	**6**
		Unit 5: Variation in chromosome number and structure Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy	**SM**	**6**
		Unit 6: Fine structure of gene Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; Structure of Phage T4, rII Locus.	**SM**	**4**
		Unit 7: Gene mutations Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Role of Transposons in mutation. DNA repair mechanisms.	**SM (upto intercata lating agents) Rest RI**	**6**
		Unit 8: Central dogma and genetic code Central Dogma, Genetic code (deciphering and salient features)	**RI**	**2**
		Unit 9: Transcription Transcription in prokaryotes; Principles of transcriptional regulation: Concept of operon; Structure and mode of control of inducible (lactose operon of E. coli) and repressible (tryptophan operon of E. coli) operons. Brief idea about eukaryotic transcription.	**RI**	**9**
		Unit 10: Translation Various steps of protein synthesis in prokaryotes.	**RI**	**4**
		Unit 11. Population genetics Allele frequencies, Genotype frequencies; Hardy-Weinberg Law.	**RI**	**3**
- UG-H-BOT-CC-P-13 **(Practical)**		1. Meiosis through temporary smear preparation	**RI**	**10**
		2. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.	**RI**	**10**
		3. Chromosome mapping using three-point test cross data	**DR**	**10**
		4. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).	**SM**	**10**
		5. Blood Typing: ABO groups and Rh factor	**SM**	**10**
		6. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.	**DR**	**10**

		7. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.	**RI**	
UG-H-BOT-CC-T-14 **(Theory)**	Plant Molecular Biology and Biotechnology	Unit 1: Plant tissue culture Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation).	**DR**	**16**
		Unit 2: Recombinant DNA technology Restriction Endonucleases (History, Types I-IV, biological role and application); Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC).	**DR**	**12**
		Unit 3: Gene cloning Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; PCR.	**SM**	**10**
		Unit 4: Methods of gene transfer Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GFP).	**SM**	**8**
		Unit 5: Applications of biotechnology Pest resistant (Bt-cotton); herbicide resistant plants (Roundup Ready soybean); Transgenic crops with improved quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines.	**RI**	**14**
UG-H-BOT-CC-P-14 (PRACTICAL)		1. Demonstration of preparation of MS medium; in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc	**DR**	**20**
		2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis and artificial seeds through photographs.	**RI**	
		3. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment.	**SM**	
		4. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr	**RI**	**10**

		tomato through photographs.		
		5. Visit to a tissue culture laboratory/ biotechnological park.		
UG-H-BOT-DSE-T-03 (THEORY)	A. Biodiversity and Conservation	Unit 1: Natural resources Definition, types and distribution.	**DR**	**2**
		Unit 2: Sustainable utilization Concept, approaches (economic, ecological and socio-cultural).	**DR**	**8**
		Unit 3: Land Utilization (agricultural, pastoral, horticultural, silvicultural); Soil degradation, restoration, conservation and management	**SM**	**8**
		Unit 4: Water Fresh water (rivers, lakes, groundwater, aquifers, watershed); Marine; Estuarine; Wetlands; Threats and management strategies.	**SM**	**8**
		Unit 5: Biological Resources Biodiversity- definition and types; Significance; Threats; Management strategies; Bioprospecting; Intellectual Property Regime (IPR); Convention on Biological Diversity (CBD); National Biodiversity Action Plan.	**SM**	**10**
		Unit 6: Forests Definition, Cover and its significance (with special reference to India); Major and minor forest products; Depletion; Management.	**DR**	**6**
		Unit 7: Energy Renewable and non-renewable sources of energy	**RI**	**6**
		Unit 8: Contemporary practices in resource management Environmental Impact Assessment (EIA), Geographical Information System (GIS), Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint; Resource Accounting; Waste management.	**RI**	**8**
		Unit 9: National and international efforts in resource management and conservation National legislations: The Biological Diversity Act, 2002; Forest Conservation Act, 1980; Case studies relevant to resource management and conservation (eg. World Heritage Sites (Natural)/ Sacred Groves/ Biodiversity Heritage Sites/ Protection of Plant Varieties.	**RI**	**4**

UG-H-BOT-DSE-P-03 (PRACTICAL)		1. Collection of data (qualitative and quantitative) on a local forest/ sacred grove cover (field visit). 2. Collection of data (qualitative and quantitative) on a designated area under Protected Area Network (field visit). 3. Collection of data (qualitative and quantitative) on a specific area exhibiting urban diversity (field visit). 4. Measurement of dominance of woody species by DBH (diameter at breast height) method. 5. Calculation and analysis of ecological footprint.	**RI DR SM**	**60**
UG-H-BOT-DSE-P-04 (PRACTICAL)		Dissertation/ Project	**(SM/RI/DR)**	

PCC

COURSE CODE	**COURSE TITLE**	**COURSE CONTENT**	**TEACHER ASSIGNED**	
UG-BOT-G-DSE-T-02	A. Biodiversity and Conservation	Unit 1: Natural resources Definition, types and distribution.	**BC (1-5) SY (6-9)**	**2**
		Unit 2: Sustainable utilization Concept, approaches (economic, ecological and socio-cultural).		**8**
		Unit 3: Land Utilization (agricultural, pastoral, horticultural, silvicultural); Soil degradation, restoration, conservation and management		**8**
		Unit 4: Water Fresh water (rivers, lakes, groundwater, aquifers, watershed); Marine; Estuarine; Wetlands; Threats and management strategies.		**8**
		Unit 5: Biological Resources Biodiversity- definition and types; Significance; Threats; Management strategies; Bioprospecting; Intellectual Property Regime (IPR); Convention on Biological Diversity (CBD); National Biodiversity Action Plan.		**12**
		Unit 6: Forests Definition, Cover and its significance (with special reference to India); Major and minor forest products; Depletion; Management.		**6**
		Unit 7: Energy Renewable and non-renewable sources of energy		**6**
		Unit 8: Contemporary practices in resource management		**8**

		Environmental Impact Assessment (EIA), Geographical Information System (GIS), Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint; Resource Accounting; Waste management.		
		Unit 9: National and international efforts in resource management and conservation National legislations: The Biological Diversity Act, 2002; Forest Conservation Act, 1980; Case studies relevant to resource management and conservation (eg. World Heritage Sites (Natural)/ Sacred Groves/ Biodiversity Heritage Sites/ Protection of Plant Varieties.		**4**
UG-BOT-G-DSE-P-02		1. Collection of data (qualitative and quantitative) on a local forest/ sacred grove cover (field visit). 2. Collection of data (qualitative and quantitative) on a designated area under Protected Area Network (field visit). 3. Collection of data (qualitative and quantitative) on a specific area exhibiting urban diversity (field visit). 4. Measurement of dominance of woody species by DBH (diameter at breast height) method. 5. Calculation and analysis of ecological footprint.	**BC**	**60**
UG-BOT-G-SEC-T-04 (Theory)	A. Ethnobotany	**Unit 1: Ethnobotany** Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Major and minor ethnic groups or tribals of India, and their life styles. Plants used by the tribals: a) food plants b) intoxicants and beverages c) Resins and oils and d) miscellaneous uses. **Unit 2: Methodology of Ethnobotanical studies** a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places. **Unit 3: Role of ethnobotany in modern medicine** Medico-ethnobotanical sources in India; Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) Azadirachta indica b) Ocimum sanctum c) Vitex negundo d) Gloriosa superba e) Tribulus terrestris f) Pongamia pinnata g) Cassia auriculata h) Indigofera tinctoria. Role of ethnobotany in modern medicine with special reference to Rauvolfia sepentina, Trichopus zeylanicus, Artemisia spp., Withania somnifera. Role of ethnic groups in conservation of plant genetic resources. Endangered taxa and forest management (participatory forest management).	**BC (1,2)** **SY (3,4)**	**30**

		Unit 4: Ethnobotany and legal aspects Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Biopiracy, Intellectual Property Rights and Traditional Knowledge.		

SM: DR SUCHETANA MUKHERJEE

RI: DR ROUSHAN ISLAM

DR: DEBRAJ ROY

BC: BHASWATI CHATTOPADHYAY

SY: SABINA YEASMIN

SRIPAT SINGH COLLEGE

ACADEMIC CALENDAR: SESSION- JAN 2025-JUNE 2025

Stream: Science

DISTRIBUTION OF COURSES IN
DEPARTMENT OF ZOOLOGY
2ND SEMESTER (MAJOR)

Course Code	Course Title	Topic	Total no. of Lectures	Teachers
ZOO-MJ-T-201 **[4 credits]** **[4 Classes PW]** **Full Marks: 55 (End Sem. 40+Internal Assessment 10+Attendance in Classes 05)**	Introduction to Chordate Diversity and its zoogeographical distribution	**Module 1: Introduction to Chordates** **Module 2: Origin of Chordata** **Module 3: Origin of Chordata** **Module 4: Agnatha** **Module 5: Pisces** **Module 6: Amphibia** **Module 7: Reptilia** **Module 8: Aves** **Module 9: Mammals** **Module 10: Zoogeography**	6 6 6 6 6 6 6 6 7 10	AB HGT SH SB DM SH AB HGT AB SD
ZOO-MJ-P-201 **[2 credits]** **[4 Classes PW] Full Marks: 20 (End Sem. 20)**	Introduction to Chordate Diversity and its zoogeographical distribution Lab	Identification of 1. Protochordata 2. Agnatha 3. Fishes 4. Amphibia 5. Reptilia preparation of dichotomous key for identification of poisonous and non-poisonous snakes. 6. Mammalia 7. Dissection of brain and pituitary of Rohu/Catla/Mrigal 8. Power point presentation on study of any two animals from two different class.	60	SB SH AB HGT DM SD UG
ZOO-SEC-2 **[3 credits]** **[3 Classes PW]** **Full Marks: 45 (End Sem. 35+Field Study 10)**	Basic concept of Aquaculture, Induced breeding and Integrated fish farming	**Module 1: Aquaculture methods** **Module 2: Different systems of aquaculture** **Module 3: Non-conventional aquaculture technology** **Module 4: Induced breeding** **Module 5: Fish pathology** **Module 6: Entrepreneurship in Aquaculture**	9 9 9 9 9 9	SB SH AB HGT DM SD UG

MINOR

Course Code	Course Title	Topic	Total no. of Lectures	Teachers
ZOO-MI-T-201 **[3 credits]** **[3 Classes PW]** **Full Marks: 35 (End Sem. 25+Internal Assessment 10)**	Comparative anatomy and Developmental Biology	**Module 1: Integumentary System** **Module 2: Skeletal System** **Module 3: Digestive System** **Module 4: Circulatory System** **Module 5: Respiratory System** **Module 6: Urinogenital System** **Module 7: Nervous System** **Module 8: Sense Organs** **Module 9: Developmental Biology**	6 6 6 6 6 6 6 6 6	HGT HGT SB SH SD DM SD AB AB
ZOO-MI-P-201 **[1 credits]** **[2 Classes PW]** **Full Marks: 15 (End Sem. 15)**	Comparative anatomy and Developmental Biology Lab	1. Study of placoid, cycloid and ctenoid scales. 2. Study of disarticulated skeleton. 3. Demonstration of Carapace and plastron. 4. Dissection of Tilapia/carp: Circulatory system/urinogenital system; brain/pituitary. 5. Study of whole mounts of developmental stages of chick .	5 10 5 10 6	SB SH AB HGT DM SD UG

4TH SEMESTER MAJOR

Course Code	Course Title	Topic	Total no. of Lectures	Teachers
ZOO-MJ-T-401 **[4 credits]** **Full Marks: 55 (End Sem. 40+Internal Assessment 10+Attendance in Classes 05)**	Cell Biology	**Module 1: Overview of Cells** **Module 2: Plasma Membrane** **Module 3: Cytoplasmic organelles I** **Module 4: Cytoplasmic organelles II** **Module 5: Cytoskeleton** **Module 6: Nucleus** **Module 7: Cell cycle and Cancer biology** **Module 8: Cell Signaling**	8 8 8 8 8 8 8 8	AB SD SB SH SD DM HGT

ZOO-MJ-P-401 [2 credits] Full Marks: 20 (End Sem. 20)	Cell Biology Lab	1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis. 2. Preparation of various stages of meiosis from temporary stained squash of grasshopper testes. 3. Temporary preparation to demonstrate: a) DNA by Feulgen reaction. b) Cell viability by Trypan Blue staining.	10 10 10	SB SH AB HGT DM SD UG
ZOO-MJ-T-402 [4 credits] Full Marks: 55 (End Sem. 40+Internal Assessment 10+Attendance in Classes 05)	Biochemistry	**Module 1: Carbohydrates** **Module 2: Lipids** **Module 3: Amino acids and Proteins** **Module 4: Nucleic acids** **Module 5: Enzymes** **Module 6: Oxidative Phosphorylation**	10 10 10 10 10 10	SB SD SH AB HGT DM
ZOO-MJ-P-402 [2 credits] Full Marks: 20 (End Sem. 20)	Biochemistry Lab	1. Qualitative tests of functional groups in carbohydrates, proteins and lipids. 2. Quantitative estimation of proteins by Lowry Method. 3. Demonstration/Virtual lab/Dry lab of paper chromatography of amino acids. 4. Demonstration/Virtual lab/Dry lab of proteins separation by SDS-PAGE. 5. Wet lab: to study the enzymatic activity of Trypsin or Lipase. 6. Wet lab: To perform the Acid or Alkaline phosphatase assay from serum/ tissue/soil	5 5 5 5 5 5	SB SH AB HGT DM SD UG

4TH SEM MINOR

Course Code	Course Title	Topic	Total no. of Lectures	Teachers
ZOO-MI-T-201 [3 credits] [3 Classes PW] Full Marks: 35 (End Sem. 25+Internal Assessment 10)	Comparative anatomy and Developmental Biology	**Module 1: Integumentary System** **Module 2: Skeletal System** **Module 3: Digestive System** **Module 4: Circulatory System** **Module 5: Respiratory System** **Module 6: Urinogenital System** **Module 7: Nervous System** **Module 8: Sense Organs** **Module 9: Developmental Biology**	6 6 6 6 6 6 6 6 6	HGT HGT SB SH SD DM SD AB AB

ZOO-MI-P-201 **[1 credits]** **[2 Classes PW]** **Full Marks: 15** **(End Sem. 15)**	Comparative anatomy and Developmental Biology Lab	1. Study of placoid, cycloid and ctenoid scales. 2. Study of disarticulated skeleton. 3. Demonstration of Carapace and plastron. 4. Dissection of Tilapia/carp: Circulatory system/urinogenital system; brain/pituitary. 5. Study of whole mounts of developmental stages of chick.	5 10 5 10 6	SB SH AB HGT DM SD UG

6TH SEMESTER HONOURS

Course Code	Course Title	Topic	Total no. of Lectures	Teachers
ZOOL-H-CCT-13 **[4 credits]** **Full Marks: 55 (End Sem. 40+Internal Assessment 10+Attendance in Classes 05)**	Developmental Biology	**Unit 1: Early Embryonic Development Unit 2: Late Embryonic Development** **Unit 3: Post Embryonic Development** **Unit 4: Implications of Developmental Biology**	15 15 15 15	SB DM AB SD
ZOOL-H-CCP-13 **[2 credits]** **Full Marks: 20 (End Sem.20)**	Developmental Biology Lab	1.Study of whole mounts of developmental stages of chick 2. Study of the developmental stages and life cycle of Drosophila 3. Study of different sections of placenta 4. Project report on Drosophila culture/aspects of chick embryo development.	8 8 8 8	SB SH AB HGT DM SD UG
ZOOL-H-CCT-14 **[4 credits]** **Full Marks: 55 (End Sem. 40+Internal Assessment 10+Attendance in Classes 05)**	Evolutionary Biology	**Unit-1 Geological time scale** **Unit-2 Population genetics** **Unit-3 Species concept** **Unit-4 Origin and Evolution of Man** **Unit-5 Phylogenetic trees**	12 12 12 12 12	SB SD AB DM HGT

ZOOL-H-DSET-04 **[4 credits]** **Full Marks: 75 (End Sem. 40+Power point presentation 20, viva-voce 15)**	Parasitology	Unit 1: Introduction to Parasitology Unit 2: Parasitic Protists Unit 3: Parasitic Platyhelminthes Unit 4: Parasitic Nematodes Unit 5: Parasitic Arthropods Unit 6: Parasite Vertebrates	10 10 10 10 10 10	SB SH AB HGT DM SD UG
ZOOL-H-DSET-06 **[4 credits]** **Full Marks: 55 (End Sem. 40+Internal Assessment 10+Attendance in Classes 05)**	Biology of Insecta	**Unit 1: Introduction to Biology of Insect** **Unit 2: Insect Taxonomy** **Unit 3: General Morphology of Insects** **Unit 4: Physiology of Insects** **Unit 5: Insect Society** **Unit 6: Insect Plant Interaction** **Unit 7: Insects as Vectors**	8 8 8 8 8 8 8	SD SH HGT SH SB AB DM
ZOOL-H-DSEP-06 **[2 credits]** **Full Marks: 20 (End Sem.20)**	Biology of Insecta Lab	1. Study of life cycle of Mosquito, various castes of Apis, Camponotus, Odontotermes 2. Methodology of collection and preservation. 3. Key to common insect orders. 4. Mounting of wings, different kinds of antennae, legs and mouth parts of insects 5. Submission of collected, preserved and mounted representative insects	6 6 6 6 6	SB SH AB HGT DM SD UG

6TH SEMESTER PCC

Course Code	Course Title	Topic	Total no. of Lectures	Teachers
ZOOL-H-DSET-06 **[4 credits]** **Full Marks: 55 (End Sem. 40+Internal Assessment 10+Attendance in Classes 05)**	Biology of Insecta	**Unit 1: Introduction to Biology of Insect** **Unit 2: Insect Taxonomy** **Unit 3: General Morphology of Insects** **Unit 4: Physiology of Insects** **Unit 5: Insect Society** **Unit 6: Insect Plant Interaction** **Unit 7: Insects as Vectors**	8 8 8 8 8 8 8	SD SH HGT SH SB AB DM
ZOOL-H-DSEP-06 **[2 credits]** **Full Marks: 20**	Biology of	1. Study of life cycle of Mosquito, various castes of Apis, Camponotus, Odontotermes 2. Methodology of collection and preservation.	6 6	SB SH

(End Sem.20)	Insecta Lab	3. Key to common insect orders. 4. Mounting of wings, different kinds of antennae, legs and mouth parts of insects 5. Submission of collected, preserved and mounted representative insects	6 6 6	AB HGT DM SD UG
ZOOL-H-SEC-04 **[2 credits]** **Full Marks: 50** **(End Sem. 40, Internal Assessment 10)**	Medical Diagnostic Techniques	**Unit 1: Diagnostics Methods Used for Analysis of Blood** **Unit 2: Diagnostic Methods Used for Urine Analysis** **Unit 3: Non-infectious Diseases** **Unit 4: Infectious Diseases** **Unit 5: Clinical Biochemistry** **Unit 6: Clinical Microbiology** **Unit 7: Tumors** **Unit 8: Lab visit**	4 4 4 4 4 4 4 4	SB SD SH HGT DM SB UG

ABBREVIATIONS:

UG – Uttam Ghosh
HGT – Dr. Himadri Guhathakurta
SD – Dr. Sajal Kr. Dey
SH – Sunita Hansda
AB – Abhishek Bagdi
DM – Debabrata Mondal
SB – Sangita Bhatta

SRIPAT SINGH COLLEGE

ACADEMIC CALENDAR: SESSION- JAN'25-JUNE'25

Stream: Science

DISTRIBUTION OF COURSES IN SEMESTER-II (NEP): JANUARY 2025 - JUNE 2025

DEPARTMENT OF MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Courses	Course title	Topic	No .of lectures (inclusive of Tutorials)	Teacher
Course category:MBBT – M-T-2.(The) 4-credit Full marks :55 (Theory 40+Internal Assessment 10+Attendence 05)	CELL BIOLOGY	*UNIT-1:Cell: Introduction and classification of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation, visualisation of cells Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport. *UNIT-2:Membrane Vacuolar system, cytoskeleton, and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion. Lysosomes: Vacuoles and micro bodies: Structure and functions. *UNIT-3 Ribosomes: Structures and function including role in protein synthesis. Mitochondria: Structure and function, Genomes, biogenesis Chloroplasts: Structure and	10 15 20	AB+DM AB+DM AB+DM

		function, genomes, biogenesis Nucleus: Structure and function, chromosomes, and their structure Extracellular Matrix: Composition, molecules that mediate cell adhesion, membrane receptors for extra cellular matrix, macromolecules, regulation of receptor expression and function. *UNIT-4: Cell Signaling: Principles of cell signaling, Signaling through G protein coupled receptor and enzyme coupled receptors, Signaling routes in regulation of gene expression Cell Cycle: Overview of the cell cycle, Cell cycle control system, Control of cell division and cell growth Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics, and molecular basis of cancer.	15	AB+DM
Course category:MBBT – M-P-2.(Pract) 2-credit Full marks:20	CELL BIOLOGY(PRACT)	1. Study the effect of temperature and organic solvents on semi permeable membrane. 2. Demonstration of dialysis. 3. Study of plasmolysis and de-plasmolysis. 4. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or Yeast cell. 5. Study of structure of any Prokaryotic and Eukaryotic cell. 6. Microtomy: Fixation, block making, section cutting, double staining of animal tissues like liver, oesophagus, stomach, pancreas, intestine, kidney, ovary, testes. 7. Cell division in onion root tip/ insect gonads. 8. Preparation of Nuclear, Mitochondrial & cytoplasmic fractions.		BB

Course category:MBBT – SEC- T-2.(The) 4-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	MICROBIAL DIAGNOSIS IN HEALTH CLINICS	*UNIT-1: Bacterial, Viral, Fungal and Protozoan Diseases of various human body systems, Disease associated clinical samples for diagnosis. How to collect clinical samples (oral cavity, throat, skin, Blood, CSF, urine, and faeces) and precautions required. Method of transport of clinical samples to laboratory and storage. Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa-stained thin blood film for malaria; Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens. *UNIT-2:Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes; Kits for Rapid Detection of Pathogens-typhoid, Dengue and HIV, Swine flu. Testing for Antibiotic Sensitivity in Bacteria- Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method. *UNIT-3: Application based capacity building through educational tours or virtual/ hands-on demonstration of principles and concepts with respect to the following: 1. Preparation and use of culture media for culturing various pathogenic	15 15 15	SB+MB AB+DM AB+DM

		microorganisms 2. Determination of minimal inhibitory concentration (MIC) of an antibiotic. 3. Serological Methods - Agglutination, ELISA		

SRIPAT SINGH COLLEGE

ACADEMIC CALENDAR: SESSION-JAN'25 - JUNE'25

Stream: Science

DISTRIBUTION OF COURSRS IN SEMESTER-II (NEP): JANUARY 2025 - JUNE 2025

DEPERTMENT Of: MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Courses	Course title	Topic	No .of lectures (inclusive of Tutorials)	Teacher
Course category: MBBT – MI-T-1 3-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	BIOLOGICAL CHEMISTRY	UNIT-I: 1.1. Carbohydrates-Importance and classification 1.2. Structure, configuration, and biochemical importance of Monosaccharides (Glucose and Fructose) Oxidation, Reduction, Osazone formation, Aldose &Ketose, Glycosides (Streptomycin, Cardiac glycosides and Ouabain) 1.3. Structure, configuration, and biochemical importance of Disachharides and glycosidic bond, Mutarotation, Haworth projection (Sucrose, Trehalose, Lactose, Maltose, Isomaltose, Cellobiose) 1.4. Structure, and biochemical importance Polysaccharides (Starch, Glycogen, Cellulose) 1.5. Lipids, Fatty acids-importance, properties and classification, Simple lipids-TAG, Complex lipids, Derived lipids, sterols, Fatty acids: Saturated and Unsaturated fatty acids with examples. UNIT-II: 2.1 Classification, structure, and physical and chemical properties of amino acids & proteins 2.2 Enzymes-classification and nomenclature. Michaelis-Menten	10 15	MB SB

		Equation-Factors influencing the enzyme reactions and Enzyme inhibition (Competitive and Non-competitive), role of co-enzymes. 2.4 Hormones, mode of action (Thyroid gland) 2.5 Vitamins- classification, sources, functions, and applications 2.6 Paper chromatography and Thin Layer Chromatography: Principles and Applications. UNIT-III: 3.1 Glycolysis 3.2 Gluconeogenesis and its significance 3.3 TCA Cycle, electron transport, Oxidative phosphorylation 3.4 Biosynthesis of Fatty acids - palmitoyl-CoA, Cholesterol, β-oxidation of fatty acid. 3.5 Transamination and Oxidative deamination reactions of amino acids. Amino acid catabolism (Phenyl ketonuria, albinism) UNIT-IV: 4.1 Urea cycle 4.2 Biosynthesis and regulation of purine and pyrimidine nucleotides, de novo and salvage pathways	15 5	AB DM
Course category: MBBT–MI-P-1 1 - credit Full marks:20	BIOLOGICAL CHEMISTRY (PRACT)	1. Preparation of normal, molar, and gm% solutions. 2. Preparation of buffers. Qualitative tests of sugars, amino acids, and lipids. 3. Separation of amino acids by paper chromatography and TLC.		BB

SRIPAT SINGH COLLEGE

ACADEMIC CALENDAR : SESSION-JAN'25 - JUNE'25

Stream: Science

DISTRIBUTION OF COURSRS IN SEMESTER-IV (NEP): JANUARY 2025 - JUNE 2025

DEPERTMENT OF : MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Courses	Course title	Topic	No .of lectures (inclusive of Tutorials)	Teacher
Course category: MBBT – M-T-4 4-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	GENERAL MICROBIOLOGY	UNIT-I: 1.1 Fundamentals, History and Evolution of Microbiology. Classification of microorganisms: Microbial taxonomy, criteria used including molecular approaches, Microbial phylogeny and current classification of bacteria. 1.2 Microbial Diversity: Distribution and characterization Prokaryotic and Eukaryotic cells, Morphology and cell structure of major groups of microorganisms eg. Bacteria, Algae, Fungi, Protozoa and Unique features of viruses.	10	SB+MB
		UNIT-II: 2.1 Cultivation and Maintenance of microorganisms: Nutritional categories of micro-organisms, methods of isolation, Purification and preservation.	10	SB+MB
		UNIT-III: 3.1 Microbial growth: Growth curve, Generation time, synchronous batch and continuous culture, measurement of growth and factors affecting growth of bacteria. 3.2 Microbial Metabolism: Metabolic pathways, amphi-catabolic and biosynthetic pathways Bacterial Reproduction: Transformation, Transduction and Conjugation. Endospores and sporulation in bacteria.	20	SB+MB
		UNIT-IV: 4.1 Control of Microorganisms: By physical, chemical and chemotherapeutic Agents.		

		Water Microbiology: Bacterial pollutants of water, coliforms and non-coliforms. Sewage composition and its disposal. 4.2 Food Microbiology: Important microorganism in food Microbiology: Moulds, Yeasts, bacteria. Major food born infections and intoxications, Preservation of various types of foods. Fermented Foods.	20	
Course category: MBBT – M-P-4 2-credit Full marks:20	GENERAL MICROBIOLOGY (PRACT)	1. Isolation of bacteria & their biochemical characterization. 2. Staining methods: simple staining, Gram staining, spore staining, negative staining, hanging drop. 3. Preparation of media & sterilization methods, Methods of Isolation of bacteria from different sources. 4. Determination of bacterial cell size by micrometry. 5. Enumeration of microorganism - total & viable count.		AB+DM
Course category: MBBT – M-T-5 4-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	BIOPHYSICS	UNIT-I: 1.1 Atomic structure and bonding: Intermolecular attractions, hydrogen bonding, vanderwaals force, hydrophobic and hydrophilic bond, polar bond, properties of water. 1.2 Thermodynamics, reaction kinetics and energy transduction: Isolated, closed, and open systems; First and second laws of thermodynamics and their biological significance; Activation energy and transition-state theory; Different orders of chemical reactions, free energy, and chemical reaction. high energy phosphate compounds (ATP, creatine phosphate, thioesters). 1.3 General Biophysics and biochemistry– Acid, base, salt, buffers, pH, pK, Henderson, Hasselbalch equation, principle of measurement of pH. UNIT-II: 2.1 Isotopes and radioactivity: Radioactivity, decay law, Radioactive labeling, Detection and measurement of radioactive	10 20	SB+MB SB+MB

		dose by GM counter, scintillation counter, autoradiography. 2.2 Hydrodynamic properties: Surface tension, diffusion, osmosis, sedimentation at molecular level. Factors affecting them. 2.3 Centrifugation – Basic Principle of Centrifugation, Instrumentation of Ultracentrifuge (Preparative, Analytical), Factors affecting Sedimentation velocity, Standard Sedimentation Coefficient, Centrifugation of associating systems, Rate-Zonal centrifugation, sedimentation equilibrium Centrifugation. UNIT-III: 3.1 X-Ray Crystallography – X-ray diffraction, Bragg equation, Reciprocal lattice, Miller indices & Unit cell, Concept of different crystal structure, determination of crystal structure [concept of rotating crystal method, powder method]. 3.2 Absorption Spectroscopy – Properties of light, molecular mechanism of the absorption of light by molecules, Beer-Lambert law, Factors affecting the absorption properties of a Chromophore. Infrared spectroscopy, Atomic absorption and emission spectroscopy, dynamic light scattering. UNIT-IV: 4.1 Spectroscopy: Raman Spectroscopy – Raman Effect, Quantum mechanical reason of Raman effect, NMR Spectroscopy – Basic principle of NMR spectroscopy, Experimental technique & instrumentation, Chemical shift, Hyperfine splitting, Relaxation process.	20 10	AB+DM AB+DM
Course category: MBBT – M-P-5 2-credit	BIOPHYSICS (PRACT)	1. Preparation of buffers: Citrate, Tris-HCl, Phosphate buffer. 2.Use of pH meter 3.Titration of amino acid (Glycine) for determination of pKa		AB+DM

Full marks:20		4. ECG pattern study. 5. Column chromatography. 6. Interpretation and measurement of X-ray diffraction pattern. 7. Verify Lambert-Beer's law by Spectrophotometer. 8. Spectrophotometric determination of unknown concentration of biomolecules (Protein/ carbohydrate/ DNA/ RNA) 9. Study the activity of any enzyme under optimum conditions 10. Paper chromatographic separation technique: Separation of amino acids and pigments after extraction from plants. 11. Thin layer (TLC) & Column chromatographic technique.		

SRIPAT SINGH COLLEGE

ACADEMIC CALENDAR : SESSION-JAN'25 - JUNE'25

Stream: Science

DISTRIBUTION OF COURSRS IN SEMESTER-IV (NEP): JAN 2025 – JUNE 2025

DEPERTMENT OFMOLECULAR BIOLOGY AND BIOTECHNOLOGY

Courses	**Course title**	**Topic**	**No .of lectures (inclusive of Tutorials)**	**Teacher**
Course category: MBBT – MI-T-2 3-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	BIOLOGY OF MICROORGANISMS	UNIT-I: 1.1 The Discovery of Microorganisms and contributions of Louis Pasteur, and Edward Jenner, Leeuwenhoek, the Conflict over spontaneous generation, Koch's postulates, the Scope and relevance of Microbiology 1.2 An overview of procaryotic cell structure; procaryotic cell membranes; the cytoplasmic matrix (inclusion bodies), ribosomes, the nucleoid, the procaryotic cell wall (gram positive & gram negative), the mechanism of gram staining; Components external to the cell wall (capsules, slime layers, and s-layers; pili and fimbriae), flagella and	10	MB

		motility (flagellar ultrastructure, mechanism of flagellar movement, chemotaxis); the bacterial endospore UNIT-II: 2.1 Nutrient requirement for bacterial growth (macro- and micronutrients, purines, pyrimidines, amino acids, vitamins), iron Uptake and Siderophores, Nutritional Types of Microorganisms; types of media (synthetic, complex, differential media) 2.2 Isolation of Pure Cultures (The Spread Plate and Streak Plate, The Pour Plate); the Growth Curve, the mathematics of growth Measurement of Microbial Growth (Cell Numbers, Cell Mass), The Continuous Culture of Microorganisms (Chemostat, Turbidostat) 2.3 The Influence of Environmental Factors on Growth (extremophiles, Halophiles), effect of pH, Temperature (Psychrophiles, Mesophiles, thermophiles, hyperthermophiles) Pressure; Quorum Sensing and Microbial Populations 2.4 The physical Methods used to control bacteria (Heat, Low Temperatures, Filtration, Radiation), The chemical Methods used to control bacteria (Phenolics, Alcohols, Halogens UNIT-III: 3.1 General Properties of Viruses, cultivation of Viruses, Viral multiplication, Attachment, entry, un-coating, replication, assembly, release, Cell transformations, Cultivation of viruses-Assay techniques 3.2 The Structure of Viruses (Virion	15	MB

		Size, General Structural Properties, Helical Capsids) types of viral nucleic Acids, Viral Envelopes and Enzymes 3.3 Animal viruses-Virus-Host interactions - Viral infections, plant viruses, bacteriophages 3.4 Host response and antiviral agents, immune responses to viruses, interferon and other cytokines, antiviral therapy, vaccines against SARS nCOV-2 and the Covid19 pandemic UNIT-IV: 4.1 Microbial Growth and Food Spoilage, Controlling Food Spoilage, Removal of Microorganisms (Low Temperature, High Temperature, Pasteurization) Chemical-Based Preservation, Radiation, bacteriocins 4.2 Food-Borne Diseases, Food-Borne Infection, Food-Borne Intoxications, Detection of Food-Borne Pathogens 4.3 Production of Fermented Milks (buttermilk, sour cream, and yogurt); Cheese Production; Production of Alcoholic Beverages (Wines and Champagnes, Beers and Ales, Distilled Spirits), Production of Breads, a brief concept on probiotics.	10 10	SB SB
Course category: MBBT–MI-P-2 1 - credit Full marks:20	BIOLOGY OF MICROORGANISMS(PRACT)	1. Demonstration, use and care of microbiological equipment. 2. Preparation of media, sterilization, and isolation of bacteria. 3. Simple staining of bacteria 4. Gram staining of Bacteria		BB

		5. Endospore staining. 6. Demonstration of starch hydrolysis by bacterial cultures. 7. Growth of fecal coliforms on selective media. 8. Isolation of pure culture by streak plate method. 9. Antibiotic sensitivity assay.		

SRIPAT SINGH COLLEGE

ACADEMIC CALENDAR : SESSION-JAN'25 - JUNE'25

Stream: Science

DISTRIBUTION OF COURSRS IN SEMESTER-VI (CBCS): JANUARY 2025 - JUNE 2025

DEPERTMENT OF : MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Courses	Course title	Topic	No .of lectures (inclusive of Tutorials)	Teacher
Course category: MBBT 601(T) 4-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	BIO ANALYTICAL TOOLS	UNIT-I: Simple microscopy, phase contrast microscopy, florescence and electron microscopy (TEM and SEM), pH meter, absorption and emission spectroscopy. UNIT-II: Principle and law of absorption fluorimetry, colorimetry, spectrophotometry (visible, UV, infra-red), centrifugation, cell fractionation techniques, isolation of sub-cellular organelles and particles. UNIT-III: Introduction to the principle of chromatography. Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion	10 15 15	AB+DM AB+DM AB+DM AB+DM

		exchange chromatography, gas chromatography, HPLC. UNIT-IV: Introduction to electrophoresis. Starch-gel, polyacrylamide gel (native and SDS-PAGE), agarose-gel electrophoresis, pulse field gel electrophoresis, immuno-electrophoresis, isoelectric focusing, Western blotting. Introduction to Biosensors and Nanotechnology and their applications.	20	
Course category: MBBT 601(P) 2-credit Full marks:20	BIO ANALYTICAL TOOLS (PRACT)	1. Native gel electrophoresis of proteins 2. SDS-polyacrylamide slab gel electrophoresis of proteins under reducing conditions. 3. Preparation of the sub-cellular fractions of rat liver cells. 4. Preparation of protoplasts from leaves. 5. Separation of amino acids by paper chromatography. 6. To identify lipids in a given sample by TLC. 7. To verify the validity of Beer's law and determine the molar extinction coefficient of NADH.		SB+MB
Course category: MBBT 602(T) 4-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	GENOMICS & PROTEOMICS	UNIT-I: Introduction to Genomics, DNA sequencing methods – manual & automated: Maxam & Gilbert and Sangers method. Pyrosequencing, Genome Sequencing: Shotgun & Hierarchical (clone contig) methods, Computer tools for sequencing projects: Genome sequence assembly software. UNIT-II: Managing and Distributing Genome Data: Web based servers and softwares for genome analysis: ENSEMBL, VISTA, UCSC Genome Browser, NCBI genome. Selected Model Organisms' Genomes and	15 10 20	AB+DM AB+DM AB+DM

		Databases. UNIT-III: Introduction to protein structure, Chemical properties of proteins. Physical interactions that determine the property of proteins. Short-range interactions, electrostatic forces, van der waal interactions, hydrogen bonds, Hydrophobic interactions. Determination of sizes (Sedimentation analysis, gel filteration, SDS-PAGE); Native PAGE, Determination of covalent structures – Edman degradation. UNIT-IV: Introduction to Proteomics, Analysis of proteomes. 2D-PAGE. Sample preparation, solubilization, reduction, resolution. Reproducibility of 2D-PAGE. Mass spectrometry based methods for protein identification. De novo sequencing using mass spectrometric data.	15	AB+DM
Course category: MBBT 602(P) 2-credit Full marks:20	GENOMICS & PROTEOMICS (PRACT)	1. Use of SNP databases at NCBI and other sites 2. Use of OMIM database 3. Detection of Open Reading Frames using ORF Finder 4. Proteomics 2D PAGE database 5. Softwares for Protein localization. 6. Hydropathy plots 7. Native PAGE 8. SDS-PAGE		AB+DM
Course category: MBBT 604 (T) 4-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	BIOSTATISTICS	UNIT-I: Types of Data, Collection represntatioon of data; Primary & secondary data, Classification and Graphical data. Statistical skewness and measures of central tendency and Dispersion. Measures of Kurtosis. UNIT-II: Probability classical & axiomatic definition of probability, Theorems on total and compound probability), Elementary ideas of	12 18	MB+SB MB+SB

		Binomial, Poisson and Normal distributions. UNIT-III: Methods of sampling, confidence level, critical region, testing of hypothesis and standard error, large sample test and small sample test. Problems on test of significance, t-test, chi-square test for goodness of fit and analysis of variance (ANOVA) UNIT-IV: Correlation and Regression. Emphasis on examples from Biological Sciences.	18 12	MB+SB MB+SB
Course category: MBBT 604(P) 2-credit Full marks:20	BIOSTATISTICS (PRACT)	1. Practical Based on graphical Representation 2. Practical Based on measures of Central Tendency & Dispersion 3. Practical Based on Distributions Binomial Poisson Normal 4. Practical Based on t, f, z and Chi-square		MB+SB
Course category: MBBT 606(T) 4-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	ENVIRONMENTAL BIOTECHNOLOGY	UNIT-I: Conventional fuels and their environmental impact – Firewood, Plant, Animal, Water, Coal and Gas. Modern fuels and their environmental impact – Methanogenic bacteria, Biogas, Microbial hydrogen Production, Conversion of sugar to alcohol Gasohol. UNIT-II: Bioremediation of soil & water contaminated with oil spills, heavy metals and detergents. Degradation of lignin and cellulose using microbes. Phyto-remediation. Degradation of pesticides and other toxic chemicals by micro-organisms-degradation aromatic and chlorinates hydrocarbons and petroleum products.	15 20 15	AB+DM AB+DM AB+DM

		UNIT-III: Treatment of municipal waste and Industrial effluents. Bio-fertilizers Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil. Algal and fungal biofertilizers (VAM). UNIT-IV: Bioleaching, Enrichment of ores by microorganisms (Gold, Copper and Uranium).	10	AB+DM
Course category: MBBT 606(P) 2-credit Full marks:20	ENVIRONMENTAL BIOTECHNOLOGY (PRACT)	1. Calculation of Total Dissolved Solids (TDS) of water sample. 2. Calculation of BOD of water sample. 3. Calculation of COD of water sample. 4. Bacterial Examination of Water by MPN Method.		MB+BB

SRIPAT SINGH COLLEGE

ACADEMIC CALENDAR : SESSION-JAN'25 - JUNE'25

Stream: Science

DISTRIBUTION OF COURSRS IN SEMESTER-VI (CBCS): JANUARY 2025 - JUNE 2025

DEPERTMENT OF : MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Courses	Course title	Topic	No .of lectures (inclusive of Tutorials)	Teacher
Course category: MBG 602(T) 4-credit Full marks :55 (Theory 40+Internal Assesment 10+Attendence 05)	IMMUNOLOGY	UNIT-I: Immune system, Organs and cells of immune system Immunity, innate immune mechanism Acquired immune mechanism, Antigen, Antigenecity (factors affecting antigenecity) Humoral immunity, main pathways of complement system. UNIT-II: Antibody structure and classes, Antibody diversity, Genes of antibodies, Theories of formation of antibodies. UNIT-III: Cell mediated immunity:	15 15 15	AB AB DM

		TC mediated immunity, NK cell mediated immunity, ADCC, delayed type hypersensitivity, cytokines and brief idea of MHC. UNIT-IV: Hypersensitivity and vaccination : General features of hypersensitivity, various types of hypersensitivity, Vaccination: Discovery, principles, significance. Concept of autoimmunity.	15	DM
Course category: MBG 602(P) 2 - credit Full marks:20	IMMUNOLOGY (PRACT)	1. Antigen –antibody reaction assessment by (i) immunoddiffusion / immunoblot / immunoelectrophoresis. 2. Electrophoretic separation of serum protein. 3. Lymphoid organs and their microscopic organization. 4. Immunization, collection of serum 5. Ouchterloney immunodiffusion 6. Radial immuno diffusion.		BB

Dr. Bibhas Bhattacharyya- BB

Dr. Abhishek Basu- AB

Ms. Debjani Mandal- DM

Mrs. Sayantani Basu - SB

Mrs. Manali Biswas- MB

SRIPAT SINGH COLLEGE
JIAGANJ, MURSHIDABAD
DEPARTMENT OF ECONOMICS
DISTRIBUTION OF COURSES IN **SEMESTER- II**, DECEMBER 2024-JUNE 2025 (SESSION 2024-2025)

NEP (Major & Minor)

COURSE	COURSE TITLE	TOPIC	NO OF LECTURES	TEACHERS
Paper 6: MAC 2 (Major Course 2)	**Introductory Macroeconomics – 6 credits**	**Unit 1: National Income Accounting, unemployment and open economy issues** **Unit 2: Income Determination in the short-run** **Unit 3: Money** **Unit 4: Inflation** **Unit 5: Unemployment**	16 16 20 08 05	AKC SKD AKC SKD AKC
Paper 7: MIC 21 (Paper 1, Minor Course 2)	**Principles of Microeconomics – 4 credits**	**Unit 1: Introduction** **Unit 2: Presentation of Unit 3: Descriptive Statistics** **Unit 4: Index Numbers**	02 02 05 04	SKD SKD SKD
Paper 10: SEC 2 (Skill Development Course 2)	**Basic Statistics**	**Unit 1: Introduction** **Unit 2: Consumer Theory** **Unit 3: Production and Cost** **Unit 4: Perfect Competition**	12 15 15 06	AKC AKC AKC SKD

SRIPAT SINGH COLLEGE
JIAGANJ, MURSHIDABAD
DEPARTMENT OF ECONOMICS
DISTRIBUTION OF COURSES IN **SEMESTER- VI**, DECEMBER 2024-JUNE 2025 (SESSION 2024-2025)
CBCS

CORE COURSE, SEC AND GE AND PCC

COURSE	COURSE TITLE	TOPIC	NO OF LECTURES	TEACHERS
ECON-H-CC-T-13	Indian Economy	1. Economic Development since Independence 2. Population and Human Development 3. Growth and Distribution 4. Economic Reforms in India	02 02 02 02	AKC AKC AKC
ECON-H-CC-T-14	Development Economics	1. Meaning of Economic Development 2. Stages of Development and Structural Change 3. Population and Economic Development 4. Development Strategies 5. Role of capital and Labour in Economic Development 6. Poverty and Inequality	02 02 02 01 01 01	SKD SKD SKD AKC AKC AKC
ECON-H-DSE-T-3A	Economic Development and Policy in India - II	1. Agriculture: Policies and Performance 2.	02	AKC AKC

		Industry: Policies and Performance 3. Foreign Trade: Trends and Policies	02 02	 AKC
ECON-H-DSE-T-4A	Dissertation	Issues pertaining to Indian economy and/or Global Economy in the present context or in the historical context.	04	SKD AKC
ECON—G-DSE-T-3A	Economic Development and Policy in India - II	1. Agriculture: Policies and Performance 2. Industry: Policies and Performance 3. Foreign Trade: Trends and Policies	02 02 02	AKC SKD AKC
ECON—G-GE-T-2	Introductory Macroeconomics	1. National Income Accounting, unemployment and open economy issues 2. Money and Inflation	02 02	AKC SKD
ECON—G-SEC-T-04	1. Introduction to Indian Public Finance	1. Concepts: 2. Understanding Union Budget	01 02	SKD AKC

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester –II (Major): January, 2025 to July, 2025

NEP -2020 (SESSION 2024-2025)

Course	Course title	Topic	No. of Lectures	Teachers
PAPER: II (Theory) CODE: GEOG-M-T-2 **Total Marks: 75** **Credits: 6** **Course Evaluation: Semester End Examination (60 Marks) and Internal Assessment (15 Marks)**	**POPULATION AND SETTLEMENT GEOGRAPHY**	**UNIT I: POPULATION GEOGRAPHY** 1. Development of Population Geography; Relation between Population Geography and Demography 2. Determinants of Population Dynamics: Fertility, Mortality and Migration 3. Population Composition (Age-Sex and Occupational Structure) 4. Theories of population growth: Malthus and Marx; Demographic Transition Theory (Thompson and Notestein) 5. Migration: types, causes and theories 6. Population Policies (India and Sweden)	 07 06 04 08 08 06	 SM SM SM SPM SPM SPM
		UNIT II: SETTLEMENT GEOGRAPHY 1. Development of Settlement Geography 2. Rural settlement: Site, situation, types and pattern 3. Morphology of rural settlements: layout-internal and external 4. Urban settlements: Census definition, Urban agglomeration; Urban sprawl, Rural-urban continuum, Rurban and Periurban 5. Urban morphology: Classical Models of Burgess, Hoyt, Harris and Ullman 6. Central Place Theory and hierarchy of settlements	 04 08 06 06 06 12	 BC BC BC AD AD AD

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester –II (Major) SEC-P-2: January, 2025 to July, 2025

NEP -2020 (SESSION 2024-2025)

Course	Course title	Topic	No. of Lectures	Teachers
Type: Skill Enhancement Course (SEC) PAPER: II (Practical) CODE: GEOG-SEC-P-2 **Total Marks: 45** **Credits: 3** **Course Evaluation: Semester End Examination (35 Marks) and Internal Assessment (10 Marks)**	**FIELD WORK**	1. Framing of relevant questionnaire/survey schedule for assessing the physical /cultural /environment /socio-economic components. A filled-in questionnaire used in the survey should be attached with the report signed by the concerned teacher and the student. 2. Drawing of maps (hand-drawn) with suitable scale and latitude and longitude. 3. Preparation of charts/graphs in MS-Excel and duly labelled. 4. The report should be typed in MS-Word. The font size is fixed at 12 in Times New Roman and the line spacing 1.5. 5. Each field work should have a certificate of authenticity duly signed by the Field supervisor.	04 04 06 06	SPM SM AD BC

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester –II (Minor): January, 2025-July, 2025

NEP -2020 (SESSION 2024-2025)

Course	Course title	Topic	No. of Lectures	Teachers
PAPER: II (Theory) CODE: GEOG-MI-T-2 **COURSE TITLE: HUMAN GEOGRAPHY** **Total Marks: 50** **Credits: 4** **Course Evaluation: Semester End Examination (40 Marks) and Internal Assessment (10 Marks)**	**HUMAN GEOGRAPHY**	1. Distribution and growth of population in India	02	SM
		2. Demographic Transition Theory	02	SM
		3. Migration: Concept, types and causes	04	SM
		4. Economic activities: Primary, Secondary and Tertiary	08	SPM
		5. Types and patterns of rural settlements	08	SPM
		6. Urban settlement: Census definition and characteristics	06	AD
		7. Functional classification of towns	04	AD
		8. Major ethnic groups in India: Santhal, Gond, Toda and Khasi	06	AD
		9. Concept of culture, Cultural hearths and Cultural diffusion	04	BC
		10. Human Development Index	02	BC

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester –IV (Major): January, 2025 to July, 2025

NEP -2020 (SESSION 2024-2025)

Course	Course title	Topic	No. of Lectures	Teachers
PAPER: IV (Theory) CODE: GEOG-M-T-4 **COURSE TITLE: CLIMATOLOGY, SOIL AND BIOGEOGRAPHY** **Total Marks: 75** **Credits: 6** **Course Evaluation: Semester End Examination (60 Marks) and Internal Assessment (15 Marks)**	**CLIMATOLOGY, SOIL AND BIOGEOGRAPHY**	**UNIT I: CLIMATOLOGY** 1. Temperature: Horizontal and vertical distribution; Heat budget of the atmosphere; Inversion of temperature: types and causes 2. Circulation in the Atmosphere: Planetary winds; Jet stream 3. Air mass and front: Origin, characteristics and types 4. Monsoon Circulation and Mechanism with reference to India 5. Condensation: Processes and forms; Mechanism of precipitation: Bergeron-Findeisen Theory, Collision and coalescence; Forms of precipitation 6. Concept of climate change; Climatic Classification after Köppen and Thornthwaite (1931 and 1948)	04 04 06 04 04 08	SM SM SM SPM SPM SPM
		UNIT II: SOIL AND BIOGEOGRAPHY 1. Factors of soil formation; Concept of soil profile; origin and profile characteristics of Laterite, Podzol and Chernozem soils 2. Physical and chemical properties of soil: Texture, structure and moisture, pH, organic matter and NPK 3. Principles of soil classification: Genetic and USDA. Concept of land capability and its classification 4. Concepts of ecology, biosphere, ecosystem, biome, ecotone, community; Energy flow in ecosystems 5. Geographical extent and characteristic features of Tropical rain forest, Taiga and Grassland biomes 6. Bio-geochemical cycles with special reference to carbon dioxide and nitrogen; Bio-diversity: Definition, types, threats and conservation measures	04 04 04 04 06 04	BC BC BC AD AD BC

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester –IV (Major) : January, 2025 to July, 2025

NEP -2020 (SESSION 2024-2025)

Course	Course title	Topic	No. of Lectures	Teachers
PAPER: V (Practical) **CODE: GEOG-M-P-5** **COURSE TITLE: CARTOGRAPHIC TECHNIQUES AND SURVEYING** Total Marks: 75 Credits: 6 Course Evaluation: Semester End Examination (50+10* = 60 Marks) and Internal Assessment (15 Marks) *Laboratory Note Book + Viva-voce: 5+5 = 10	**CARTOGRAPHIC TECHNIQUES AND SURVEYING**	1. Construction of Scales: Linear, Comparative, Diagonal and Vernier	**06**	**BC**
		2. Representation of Data on Map by Proportional Circles, Dots and Spheres, Isolpleth and Choropleth methods	**04**	**BC**
		3. Diagrammatic Representation of Data: Bar and Age-sex Pyramid Diagram, Pie Diagram	**08**	**SPM**
		4. Preparation and Interpretation of Climograph, Taylor Hythergraph and Ergograph	**08**	**SPM**
		5. Measures of Concentration: Location Quotient	**06**	**SM**
		6. Proximity Analysis: Nearest Neighbour Analysis	**04**	**SM**
		7. Traversing by Prismatic Compass and Dumpy Level Surveying with One Change Point (profile drawing and contouring)	**08**	**AD**
		8. Determination of height of objects by Transit Theodolite (level ground base accessible case)	**04**	**AD**

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester -IV (NEP - Minor): January, 2025 to July, 2025 *NEP -2020 (SESSION 2024-2025)*

Course	Course title	Topic	No. of Lectures	Teachers
Type: Minor PAPER: II (Theory) COURSE CODE: GEOG-MI-T-2 **COURSE TITLE: HUMAN GEOGRAPHY** **Total Marks: 50 Credits: 4 Course Evaluation: Semester End Examination (40 Marks) and Internal Assessment (10 Marks)**	**Research Methodology and Field Work**	1. Distribution and growth of population in India	04	BC
		2. Demographic Transition Theory	04	BC
		3. Migration: Concept, types and causes	04	SM
		4. Economic activities: Primary, Secondary and Tertiary	08	SM
		5. Types and patterns of rural settlements	06	SM
		6. Urban settlement: Census definition and characteristics	06	SPM
		7. Functional classification of towns	04	SPM
		8. Major ethnic groups in India: Santhal, Gond, Toda and Khasi	04	SPM
		9. Concept of culture, Cultural hearths and Cultural diffusion	04	AD
		10. Human Development Index	02	AD

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester -VI: Jan, 2025 to July, 2025

***Core Course (CC)* CBCS**

Course	Course title	Topic	No. of Lectures	Teachers
GEO/H/CC/T/13: (Theory): **Evolution of Geographical Thoughts** **6 Credits**	**Evolution of Geographical Thoughts**	**Unit-I: Nature of Pre Modern Geography** 1. Development of Geography and contributions of Greek, Chinese and Indian geographers 2. Impact of 'Dark Age' on Geography and Arab contributions 3. Geography during the Age of 'Discovery' and 'Exploration' (Contributions of Portuguese Voyages, Columbus, Vasco da Gama, Magellen, Thomas Cook) 4. Transition from Cosmography to Scientific Geography (Contributions of Bernard Varenius and Immanuel Kant); Dualism and Dichotomies (General vs. Particular, Physical Vs. Human, Regional vs. Systematic, Determinism vs.Possibilism, Ideographic vs. Nomothetic) **Unit-II: Foundations of Modern Geography and Recent Trends** 1. Evolution of Geographical thoughts in Germany, France, Britain and United States of America 2. Contributions of Humbolt and Ritter 3. Contributions of Ratzel, Richthofen and Hettner 4. Schools of Geographical thought: French, British and American 5. Trends of Geography in the post World War-II period 6. Evolution of Geographical thought in India 7. Quantitative Revolution and its impact; the perspectives of Behaviouralism, Systems approach, Radicalism and Feminism in Geography 8. Towards Post Modernism: Changing concept of space in Geography; Geography in the 21st Century	04 04 04 04 04 04 02 04 06 06 04 06	SPM SPM SPM SPM SM SM SM SM SM SPM SPM SPM

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester -VI: Jan, 2025 to July, 2025

Core Course (CC) **CBCS**

Course	Course title	Topic	No. of Lectures	Teachers
CC14: Disaster Management **6 Credits** **GEO/H/CC/T/14 : (Theory):** **Disaster Management** **4 Credits**	**Urban Geography**	**Unit-I: Concepts** 1. Classification of Hazards and Disasters 2. Approaches to hazard study: Risk perception and vulnerability assessment; Hazard paradigms 3. Responses to hazards and disasters: Preparedness, trauma and aftermath; Resilience and capacity building 4. Hazards mapping: Data and techniques **Unit-II: Disaster Case Studies** 1. Earthquake: Factors, vulnerability, consequences and management 2. Landslide: Factors, vulnerability, consequences and management 3. Cyclone: Factors, vulnerability, consequences and management 4. Fire: Factors, vulnerability, consequences and management	02 04 04 04 02 04 02 04	SM SM SM SM SPM SPM SPM SPM
GEO/H/CC/P/14 : (Practical): Disaster Management **2 Credits**		**PROJECT REPORT**	08	SM & SPM

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester -VI: Jan, 2025 to July, 2025

DSE (Discipline Specific Elective)

CBCS CBCS

Course	Course title	Topic	No. of Lectures	Teachers
GEO/H/DSE/T/03/B: (Theory) **Discipline Specific Elective (DSE):** **DSE/03:** **Resource Geography** **6 Credits**	**Resource Geography**	**Unit-I** 1. Natural Resources: Concept and Classification 2. Approaches to resource utilisation :Utilitarian, conservational, community based adaptive 3. Conservation of Natural Resources – Need and Significance 4. Problems of resource depletion - Global scenario (forest, water, fossil fuels) **Unit-II** 1. Distribution, Utilisation, Problems and Management of Metallic Resources: Iron ore, Bauxite 2. Distribution, Utilisation, Problems and Management of Non-Metallic Mineral Resources: Mica, Gypsum 3. Problems and Management of Energy Resources: Conventional and non-conventional 4. Contemporary Energy Crisis and Future Scenario 5. Limits to Growth and Sustainable use of Resources: Health and Unemployment	06 06 04 04 02 04 04 02 02	BC BC BC BC AD AD AD AD AD

Sripat Singh College

Jiaganj, Murshidabad

Department of Geography

Distribution of Courses in Semester -VI: Jan, 2025 to July, 2025

DSE (Discipline Specific Elective)

CBCS CBCS

Course	Course title	Topic	No. of Lectures	Teachers
DSE/04: Soil and Bio Geography or Agricultural Geography **6 Credits** **GEO/H/DSE/T/04/A: (Theory):** **Soil and Bio Geography**	**Resource Geography**	1. Factors of soil formation; Man as an active agent of soil transformation	06	BC
		2. Concept of soil profile; origin and profile characteristics of Lateritic, Podzol and Chernozem soils	06	BC
		3. Definition and significance of soil properties: Texture, structure and moisture	04	BC
		4. Definition and significance of soil properties: pH, organic matter and NPK	04	BC
		5. Soil erosion and degradation: Factors, processes and mitigation measures	02	BC
		6. Principles of soil classification: Genetic and USDA. Concept of land capability and its classification	04	AD
		7. Concepts of ecology, biosphere, ecosystem, biome, ecotone, community	04	AD
		8. Concept of trophic structure, food chain and food web; Energy flow in ecosystems	02	AD
		9. Geographical extent and characteristic features of Tropical rain forest, Taiga and Grassland biomes	02	AD
		10. Bio-geochemical cycles with special reference to carbon dioxide and nitrogen	04	AD
		11. Deforestation: Causes, consequences and management	04	AD
		12. Bio-diversity: Definition, types, threats and conservation measures	04	AD

Department of Computer Science
Academic Calendar
Session: January-June, 2025
Semester: IV, Computer Science Major (NEP)

Courses	Course Title	Topic	Concern Teacher	Number of Lecture
CS-MJ-T-4 **&** **CS-MJ-P-4**	**Data Structure** **(**Lab works to be taken with concerns Topics**)**	**Basic definitions**; classifications; ADT; Linear Data Structures- Sequential representations; Non- linear data structures– representations.	BB	2L
		Arrays Single and Multi-dimensional Arrays; Sparse Matrices (Array and Linked Representation); Row-major and column-major order; different applications	UD	4L
		Stacks Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Evaluation of postfix expression using stack; Applications of stack; Limitations of Array representation of stack 6	BB	6L
		Linked Lists Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular representation of Stack in Lists; Self Organizing Lists; Skip Lists **Queues** Array and Linked representation of Queue, De-queue, Priority Queues	UD	10L
		Recursion Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation); Tail Recursion; When not to use recursion; Removal of recursion.	BB	4L
		Trees and Graphs Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion , Recursive and Iterative Traversals on Binary Search Trees); Different properties of Binary trees; Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees); B- tree, B+ tree; Graphs Representations, Breadth-first and Depth-first Search.	UD	10L
		Searching and Sorting Linear Search, Binary Search, Comparison of Linear and Binary Search; Bubble Sort, Selection Sort, Insertion Sort, Heap Sort, Merge Sort, Radix Sort, Bucket Sort, Shell Sort; Comparison of Sorting Techniques	BB	10L
		Hashing Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collision by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function	UD	4L
		File Structures Sequential and Direct Access. Relative Files, Indexed Files- B+ tree as index. Multi-indexed Files, Inverted Files, Hashed Files.	BB	4L

Semester: IV, Computer Science Major (NEP)

Courses	Course Title	Topic	Concern Teacher	Number of Lecture
CS-MJ-T-5	**Discrete Mathematics**	**Introduction:** Sets- finite and Infinite sets, uncountably Infinite Sets; functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting- Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.	BB	15L
		Growth of Functions: Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals	UD	12L
		Recurrences: Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem	BB UD	7L 3L
		.**Graph Theory** Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees	UD	15L
		Propositional Logic Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory	BB	8L

DEPARTMENT OF COMPUTER SCIENCE

5th Semester Syllabus distribution for the academic year 2024-2025

PCC

Teachers' Name	COURSE		
	DSE-L-501A	**DSE-P-501A**	**SEC-P-503**
BIPLAB BISWAS	**Algorithm Design Techniques**: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms. **Sorting Techniques:** Elementary sorting techniques-Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques-Heap Sort, Quick Sort, Sorting in Linear Time-Bucket Sort, Radix Sort and Count Sort **Complexity Analysis:** Medians & Order Statistics. **Data Structures:** 1.Queues :-Array and Linked representation of Queue, De-queue, Priority Queues 2. Linked Lists :-Singly, Doubly and Circular Lists, representation of Stack and Queue as Linked Lists. 3. Recursion :-Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion;	1. Implement Insertion Sort (The program should report the number of comparisons) 2. Implement Merge Sort(The program should report the number of comparisons) 3. Implement Heap Sort (The program should report the number of comparisons) 4. Implement Randomized Quick sort (The program should report the number of comparisons) 5. Implement Radix Sort.	**GUI Environment:** Introduction to graphical user interface (GUI), programming language (procedural, object oriented, event driven), the GUI environment, compiling, debugging, and running the programs. **Operations:** Data types, constants, named & intrinsic, declaring variables, scope of variables, val function, arithmetic operations, formatting data. **Forms Handling :** Multiple forms creating, adding, removing forms in project, hide, show method, load, unload statement, me keyword, referring to objects on a different forms. **Software Lab Based on Visual Basic:** 1. Write a VB application to compute the sum of two variables. 2. Write a VB application to compute the factorial of a number n. 3. Write a VB application to compute the Fibonacci series of a number n. 4. Write a VB application to compute the series of prime numbers till number n. 5. Write a VB application to compute the maximum of three numbers. 6. Write a VB application to compute the sum of odd numbers and even numbers in an array of n integers. 7. Write a VB application to compare the strings.

UTSAB DATTA	**Introduction** Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm **Searching Techniques:** Linear and Binary search.. **Data Structures:** 1. Arrays:- Single and Multi-dimensional Arrays, Sparse Matrices 2. Stacks:- Implementing stack using array and linked list, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; 3. Trees :-Introduction to Tree as a data structure; Binary Trees, Binary Search Tree, (Creation, and Traversals of Binary Search Trees)	1. Implement Searching Techniques 2. Implementation of Recursive function. 3. Array and Linked list implementation of Stack and Queue. 4. Implementation of Single, Double and circular Linked List 15. Creation and traversal of Binary Search Tree.	**Controls :** Introduction to controls textboxes, frames, check boxes, option buttons, images, setting borders and styles, the shape control, the line control, working with multiple controls and their properties, designing the user interface, keyboard access, tab controls, default & cancel property, coding for controls. **Decision Making :** If statement, comparing strings, compound conditions (and, or, not), nested if statements, case structure, using if statements with option buttons & check boxes, displaying message in message box, testing whether input is valid or not. **Iteration Handling:** Do/loops, for/next loops, using msgbox function, using string function. **Software Lab Based on Visual Basic:** 1. Write a VB application to make a calculator. 2. Write a VB application to choose your hobbies from a list. 3. Write a VB application to illustrate the use of colour radio button. 4. Write a VB application to illustrate the use of colour scroll bar form. 5. Write a VB application to illustrate the use of colour scroll bar label text. 6. Write a VB application to illustrate the use of colour text box. 7. Write a VB application to show a timer.

Sripat Singh College
Jiaganj, Murshidabad

Department of Environmental Science

Distribution of Courses in Semester -II: From January, 2025 to June, 2025

NEP -2020 (SESSION 2024-2025)

Course	Course title	Topic	No. of Lectures	Teachers
MAJOR (Code- ENVS-M-2) **FULL MARKS: 75** **Semester End Exam-40** **Practical-20** **Internal Assessment-15**	**Environmental Pollution & Mitigation**	**Unit 1:Introduction** **Unit 2: Air Pollution** **Unit 3: Water Pollution** **Unit 4: Soli Pollution** **Unit 5: Noise Pollution** **Unit 6: Radioactive Pollution** **Unit 7: Marine Pollution** **Unit 8: pollution control** **Unit 9: Environmental disasters** **ENVS-M-2-P (PRACTICAL)**	08 08 08 08 08 08 08 08 05 06	AK AK AK AK AK RP RP RP RP AK & RP
MINOR Code- ENVS-MI-Course 1 **FULL MARKS: 50** **Semester End Exam-40** **Internal Assessment-10**	**Environmental Pollution**	**Unit 1: Air Pollution** **Unit 2: Water Pollution** **Unit 3: Soil Pollution** **Unit 4: Solid & Hazardous Waste** **Unit 5: Noise Pollution & Radioactive Pollution** **Unit 6: PRACTICAL**	08 09 08 08 09 08	AK AK AK RP RP AK&RP

Sripat Singh College
Jiaganj, Murshidabad

Department of Environmental Science

Distribution of Courses in Semester -II: From January, 2025 to June, 2025

SEC (Skilled Enhancement Course)

NEP -2020 (SESSION 2024-2025)

Course	Course title	Topic	No. of Lectures	Teachers
SEC **(Code: ENVS-SEC-2-P)** **FULL MARKS: 45** **Semester End Exam-35** **Internal Assessment-10**	**SOIL QUALITY ANALYSIS & NOISE MONITORING**	**Unit 1: Soil sampling Techniques** **Unit 2: Physicochemical analysis soil & sediment** **Unit 3: Measurement of sound quality & noise level, L_{eq}** **Unit 4: Field visit**	16 16 16 02	AK RP AK AK &RP

Sripat Singh College
Jiaganj, Murshidabad

Department of Environmental Science

Distribution of Courses in Semester –IV (Major): From January, 2025 to June, 2025

NEP -2020 (SESSION 2024-2025)

Course	Course title	Topic	No. of Lectures	Teachers
MAJOR (Code- ENVS-M-4) **FULL MARKS: 75** **Semester End Exam-40+ 15(Internal Assessment)-55** **Practical-20**	**Fundamentals of Environmental Chemistry & Environmental Physics**	**Unit 1: Fundamentals of environmental chemistry**	09	AK
		Unit 2: Chemistry of environmental pollutants	10	AK
		Unit 3: Atmospheric chemistry	10	AK
		Unit 4: Water chemistry	09	AK
		Unit 5: Soil chemistry	09	RP
		Unit 6: Fundamentals of environmental physics	10	RP
		Unit 7: Movements of pollutants in environment	09	RP
		Unit-8:ENVS-M-4-P (PRACTICAL)	09	AK & RP
MAJOR (Code- ENVS-M-5) **FULL MARKS: 75** **Semester End Exam-40+ 15(Internal Assessment)-55** **Practical-20**	**Environmental Toxicology & Health**	**Unit 1: Introduction to environmental toxicology**	09	AK
		Unit 2: Toxicity of heavy metls & metalloids	10	AK
		Unit 3: Pesticide toxicity	10	AK
		Unit 4: Emerging contaminants	09	AK
		Unit 5: Environmental epidemiology	09	RP
		Unit 6: Environmental health	10	RP
		Unit 7: Practical **ENVS-M-5-P (PRACTICAL)**	09	RP AK & RP

Sripat Singh College
Jiaganj, Murshidabad

Department of Environmental Science

Distribution of Courses in Semester –IV (MINOR): From January, 2025 to June, 2025

NEP -2020 (SESSION 2024-2025)

Course	Course title	Topic	No. of Lectures	Teachers
MINOR **Code- ENVS-MI-course 2** **FULL MARKS: 50** **Semester End Exam-40** **Internal Assessment-10**	**Basics of Biodiversity**	**Unit 1: Levels of organization in living world** **Unit 2: Introduction to biodiversity** **Unit 3: Threats to biodiversity** **Unit 4: Biodiversity conservation** **Unit 5: Practical**	09 09 08 09 08 07	AK AK AK RP RP AK&RP

Sripat Singh College
Jiaganj, Murshidabad

Department of Environmental Science

Distribution of Courses in Semester -VI: From January, 2025 to June, 2025

CBCS

Core Course (CC)

Course	Course title	Topic	No. of Lectures	Teachers
CORE COURSE 13 (Code: UG-ENVS-H-CC-13) **FULL MARKS: 75** **Semester End Exam-40** **Practical-20** **Internal Assessment-10 (test exam)+5(attendance)=15**	**Environmental legislation & Policy**	**Unit 1: Introduction** **Unit 2: History of environmental legislation & policy** **Unit 3: Environmental legislation** **Unit 4: Legislative instruments** **Unit-5: Government institutions** **Unit 6: Case studies** **Unit 7: International laws & policy** **UG-ENVS-H-CC-P - 13 (Practical)**	12 12 12 12 12 12 12 08	AK RP AK AK RP RP AK AK
CORECOURSE 14 (Code: UG-ENVS-H-CC-14) **FULL MARKS: 75** **Semester End Exam-40** **Practical-20** **Internal Assessment-10 (test exam)+5(attendance)=15**	**Urban Ecosystem**	**Unit 1: Introduction** **Unit 2: Environment in an urban setting** **Unit 3: Urban dwelling** **Unit 4: Urban interface with the environment** **Unit 5: Natural spaces in a city** **Unit 6: planning & environmental management** **UG-ENVS-H-CC-P - 14 (Practical)**	09 11 10 10 11 09 06	AK AK RP RP AK RP RP

Sripat Singh College
Jiaganj, Murshidabad

Department of Environmental Science

Distribution of Courses in Semester -VI: From January, 2025 to June, 2025

CBCS

DSE (Discipline Specific Elective)

Course	Course title	Topic	No. of Lectures	Teachers
DISCIPLINE SPECIFIC ELECTIVE 03a (Code: UG-ENVS-H-DSE -03a) **FULL MARKS: 75** **Semester End Exam-40** **Practical-20** **Internal Assessment-10 (test exam)+5(attendance)=15**	**Natural Hazards & Disaster management**	**Unit 1: Introduction** **Unit 2: Natural Hazards** **Unit 3: Anthropogenic Hazards** **Unit 4: Risk & vulnerability assessment** **Unit 5: Mitigation & Prepardness** **Unit 6: disaater management in India** **UG-ENVS-H-DSE-P - 03a (Practical)**	08 08 08 09 09 09 08	RP RP AK AK AK RP AK
DISCIPLINE SPECIFIC ELECTIVE 04 (Code: UG-ENVS-H-DSE- 04) **FULL MARKS: 75** **Semester End Exam-40** **Practical-20** **Internal Assessment-10 (test exam)+5(attendance)=15**	**DISSERTATION**	**A dissertation has to be prepared on consultation with teachers/mentors on a topic from any area of Environmental Science. During examination a thorough viva-voce will be conducted by the examiners / adjudicators. The dissertation will be evaluated on the basis of written documents submitted by the candidate, originality and importance.** *A power point presentation has to be prepared and a short oral presentation will be considered for continuous evaluation. A PDF file/print copy of the power point will be required to be submitted.*	**Two months to Three months** **15 DAYS TO 20 DAYS**	**AK** **AK & RP**