CHEMISTRY
PROGRAM SPECIFIC OUTCOME FOR CCF

SEM-I (Major) / SEM-I/III (Minor)

PSO1. Understand extranuclear structure of atoms and Periodicity of the elements.

PSO2. Understand bonding, physical properties, basic stereochemistry and reaction mechanism in organic molecules.

PSO3. Study the fundamentals of Thermodynamics and Chemical Kinetics.

PSO4. Study the calibrations and uses of apparatus, preparation of primary standard solutions, standardization of secondary standard solutions, estimations of analytes using basic acid-base and redox titrations.

SEM-II (Major) / SEM-II/IV (Minor)

PSO5. Understand the gaseous state of matter on the basis of Kinetic Theory and Real gas formalism.

PSO6. Understand chemical bonding in inorganic molecules on the basis of Valence-bond (VB) and Molecular Orbital (MO) theory.

PSO7. Study the fundamentals of Reactive intermediates, Reaction thermodynamics and kinetics for organic molecules along with stereochemical descriptors and free radical substitution reactions.

PSO8. Understand the principles of iodometry and iodimetry and apply it to estimate (a) metal contents in ores / minerals and (b) specific analytes in commercial chemicals / drugs

SEM-III (Major)

PSO9. Understand the second law of thermodynamics and its applications to systems of variable composition and chemical equilibrium.

PSO10. Understand the fundamentals of ionic equilibrium and electrical conductance in solution.

PSO11. Learn to determine the rate constants of a miscellany of first-order / second-order reactions using titrimetry / polarimetry and to understand the role of catalysis.

PSO12. Understand Electrophilic and Nucleophilic aromatic substitutions, organic acids and bases and tautomerism.

PSO13. Understand fundamentals of general Substitution and Elimination reactions and chemistry of alkenes and alkynes

PSO14. Learn to identify pure solid and liquid organic compounds.

IDC

PSO15. Understand Quantitative Analysis and Basic Laboratory Practices including safety protocols.

PSO16. Understand common toxic chemicals and safety measures in their handling, cleaning, drying and calibrations of glass wares and instruments, preparation of TLC plates and separation of amino acids, estimations of alkali content in commercial detergents / soaps.

Scottish Church College

Department of Chemistry

Course Outcome (CCF)

Major

SEM	Subject	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome
1	Inorganic Chemistry	CHEM-H-CC1-1-Th	Fundamentals of Chemistry 1	Extra nuclear structure of atoms and Periodicity	15	After the completion of this course, the student will understand: Quantum numbers and their significance, Schrödinger's wave equation, significance of ψ and ψ^2. Radial and angular wave functions for hydrogen atom. Radial and angular distribution curves. Shapes of s, p, d and f orbitals. Pauli's Exclusion Principle, Hund's rules and multiplicity, Exchange energy, Aufbau principle and its limitations, Ground state Term symbols of atoms and ions. Modern IUPAC Periodic table, Effective nuclear charge, screening effects and penetration, Slater's rules, atomic radii, ionic radii (Pauling's univalent), covalent radii, lanthanide contraction. Ionization potential, electron affinity and electronegativity (Pauling's, Mulliken's and Allred-Rochow's scales) and factors influencing these properties, group electronegativities. Group trends and periodic trends in these properties in respect of s-, p- and d-block elements. Secondary periodicity, Relativistic Effect, Inert pair effect.
	Organic Chemistry			Basics of Organic Chemistry Bonding and Physical Properties	10	After the completion of this course, the student will understand: 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. MO theory: qualitative idea about molecular orbitals, bonding and antibonding interactions, idea about σ, σ*, π, π *, n – MOs; concept of HOMO, LUMO and SOMO; 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 [8] annulene (including mononuclear heterocyclic

						compounds up to 6-membered ring); concept of antiaromaticity and homoaromaticity; non-aromatic molecules; Frost diagram (qualitative drawing). Physical properties: influence of hybridization on bond properties: bond dissociation energy (BDE) and bond energy; bond distances, bond angles; concept of bond angle strain; melting point/boiling point and solubility of common organic compounds in terms of covalent & non-covalent intermolecular forces; polarity of molecules and dipole moments; relative stabilities of isomeric hydrocarbons in terms of heat of hydrogenation and heat of combustion data.
	Physical Chemistry			Stereochemistry – 1	05	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, molecular chirality and centre of chirality; asymmetric and dissymmetric molecules; enantiomers and diastereomers; 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).
				1. Thermodynamics – 1 2. Chemical Kinetics – 1	15	1st law of Thermodynamics: Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics; Concept of heat, work, internal energy and statement of first law; enthalpy, H; relation between heat capacities, calculations of q, w, ΔU and ΔH for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions; Joule's experiment and its consequence. Thermochemistry: Standard states; Heats of reaction; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; Laws of thermochemistry; bond energy, bond dissociation energy and resonance energy from thermochemical data, Kirchhoff's equations; Adiabatic flame temperature. Rate law, order and molecularity: Introduction of

						rate law, Extent of reaction; rate constants, order; Forms of rates of First, second and nth order reactions; Pseudo first order reactions (example using acid catalyzed hydrolysis of methyl acetate); Determination of order of a reaction by half-life and differential method; Rate determining step and steady-state approximation – explanation with suitable examples;), Opposing reactions, consecutive reactions and parallel reactions (with explanation of kinetic and thermodynamic control of products; all steps first order), Role of Temperature : Temperature dependence of rate constant; Arrhenius equation, energy of activation
1	Inorganic Chemistry	CHEM-H-CC1-1-P	Inorganic Chemistry (1) Lab	Acid and Base Titrations, Oxidation-Reduction Titrations:	30	After the completion of this course, the student will understand: Calibration of instruments, preparation of standard solutions, standardizations of secondary standard solutions, their uses and how to store them. Estimation of carbonate and hydroxide present together in mixture 2. Estimation of carbonate and bicarbonate present together in a mixture. 3. Estimation of free alkali present in different soaps/detergents. 1. Estimation of Fe(II) using standardized KMnO4 solution 2. Estimation of oxalic acid OR sodium oxalate in a given mixture 3. Estimation of Fe(II) and Fe(III) in a given mixture using $K_2Cr_2O_7$ solution. 4. Estimation of Fe(III) and Mn(II) in a mixture using standardized KMnO4 solution 5. Estimation of Fe(III) and Cu(II) in a mixture using K2Cr2O7.
2	Physical Chemistry	CEMA-CC-1-1-TH	Fundamentals of Chemistry -II	1. Kinetic Theory and Gaseous state 2. Real gas and Virial equation	15	After the completion of this course, the student will understand: 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); Wall collision and rate of effusion Nature of distribution of velocities, Maxwell's distribution of speeds in one, two and three dimensions; Kinetic energy distribution in one, two and three dimensions, calculations of average, root mean square and most probable values in each case; Calculation of number of molecules having energy $\geq \varepsilon$, Principle of equipartition of energy and its application to calculate the classical limit of molar heat capacity of gases 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, other equations of state (Berthelot, Dietrici); Existence of critical state, Critical constants in terms of van der Waals constants; Law of corresponding states; virial equation of state; van der Waals equation expressed in virial form and significance of second virial coefficient; Intermolecular forces (Debye, Keesom and London interactions; Lennard-Jones Potential)

	Inorganic Chemistry			Chemical Bonding – 1	15	(i) Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its application and limitations. Packing of ions in crystals. Born-Landé equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy. Defects in solids (elementary idea). Solubility energetics of dissolution process (ii) Covalent bond: Polarizing power and polarizability, ionic potential,Fazan's rules. Lewis structures, formal charge. Valence Bond Theory. The hydrogen molecule (Heitler-London approach), directional character of covalent bonds, hybridizations, equivalent and non-equivalent hybrid orbitals, Bent's rule, Dipole moments, VSEPR theory, shapes of molecules and ions containing lone pairs and bond pairs (examples from main groups chemistry) and multiple bonding (σ and π bond approach). (i) Molecular orbital concept of bonding (The approximations of the theory, Linear combination of atomic orbitals (LCAO)) (elementary pictorial approach): sigma and pibonds and delta interaction, multiple bonding. Orbital designations: gerade, ungerade, HOMO, LUMO. Orbital mixing, MO diagrams of H_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2, and their ions wherever possible; Heteronuclear molecular orbitals: CO, NO, NO^+ , CN^- , HF, BeH_2, CO_2 and H_2O. Bond properties: bond orders, bond lengths. (ii) Metallic Bond: Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids. (iii) Weak Chemical Forces: Hydrogen bonding (theories of hydrogen bonding, valence bond treatment), receptor-guest interactions, Halogen bonds. Effects of chemical force, melting and boiling points.
	Organic Chemistry			1. Stereochemistry – 2 2. General Treatment of Reaction Mechanism –1	15	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 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. Reactive intermediates: carbocations (carbenium

						and carbonium ions), non-classical cabocations, carbanions, carbon radicals, carbenes: generation and stability, structure using orbital picture and electrophilic/nucleophilic behavior of reactive intermediates (elementary idea). Reaction thermodynamics: free energy and equilibrium, enthalpy and entropy factor, calculation of enthalpy changes via BDE, intermolecular & intramolecular reactions. Reaction kinetics: rate constant and free energy of activation; 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 β-secondary kinetic isotopic effect (kH /kD); principle of microscopic reversibility; Hammond's postulate. Free-radical substitution reaction: halogenation of alkanes, mechanism (with evidence) and stereochemical features; reactivity-selectivity principle in the light of Hammond's postulate.
2	Analytical Chemistry	CHEM-H-CC2-2-P	General Chemistry Lab	Chemistry Practical	30	After the completion of this course, the student will understand: Basics of iodometry and iodimetry Standardization of $Na_2S_2O_3$ against standard dichromate solution (iodimetry) Estimation of Vitamin C 2. Estimation of (i) arsenite and (ii) antimony iodimetrically, Estimation of available chlorine in bleaching powder Estimation of Cu in brass. 2. Estimation of Cr and Mn in Steel. 3. Estimation of Fe in cement
3	Physical Chemistry	CHEM-H-CC3-3-Th	Physical Chemistry -1	1. Thermodynamics – 2 2. Applications of Thermodynamics – 1 3. Electrochemistry – 1	45	After the completion of this course, the student will understand: Second Law: Need for a Second law; statement of the second law of thermodynamics; Concept of heat reservoirs and heat engines; Carnot cycle; Carnot engine and refrigerator; Kelvin – Planck and Clausius statements and equivalence of the two statements with entropic formulation; Carnot's theorem; Values of dQ/T and Clausius inequality; Physical concept of Entropy; Entropy is a measure of the microscopic disorder of the system. Entropy change of systems and surroundings for various processes and transformations; Entropy and unavailable work; Auxiliary state functions (G and A) and their variation with T, P and V. Criteria for spontaneity and equilibrium. Thermodynamic relations: Maxwell's relations; Gibbs- Helmholtz equation, Joule-Thomson experiment and its consequences; inversion temperature; Joule-Thomson coefficient for a van der Waals gas; General heat capacity relations, Systems of Variable Composition: Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs-Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases. Activities and activity coefficients. Fugacity and fugacity coefficient.

						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; Van't Hoff's reaction isobar and isochore from different standard states; Le Chatelier's principle and its derivation, variation of equilibrium constant under different conditions Nernst's distribution law; Application- (eg. dimerization of benzene in benzoic acid). Solvent Extraction. Ion 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; Debye-Huckel limiting law-brief qualitative description. Estimation of activity coefficient for electrolytes using Debye-Huckel limiting law. Ostwald's dilution law; Ionic mobility; Application of conductance measurement (determination of solubility product and ionic product of water); Conductometric titrations. Transport number, Principles of Hittorf's and Moving-boundary method; Wien effect, Debye-Falkenhagen effect, Walden's rule Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di-and triprotic acids (exact treatment), Salt hydrolysis- calculation of hydrolysis constant, degree of hydrolysis and pH for different salts (exact Treatment). Determination of hydrolysis constant conductometrically. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action. Qualitative treatment of acid–base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations. Multistage equilibrium in polyelectrolyte systems; hydrolysis and hydrolysis constants
3	Physical Chemistry	CHEM-H-CC3-3-P	Physical Chemistry Practical	Kinetic studies of Chemical reactions	30	After the completion of this course, the student will be able to determine: 1. rate constant of the reaction between H_2O_2 and acidified KI solution using Clock reaction in absence or in the presence of catalyst 2. rate constant for the first order acid catalyzed hydrolysis of an ester. 3. the kinetics of the inversion of cane sugar using a

						polarimeter.
3	Organic Chemistry	CHEM-H-CC4-3-Th	Organic Chemistry – 1	1. Aromatic Substitution 2. General Treatment of Reaction Mechanism – 2 3. Substitution and Elimination Reactions 4. Chemistry of alkenes and alkynes	30	After the completion of this course, the student will understand: Electrophilic aromatic substitution: mechanisms and evidences in favour of it; orientation and reactivity; reactions: nitration, nitrosation, sulfonation, halogenation, Friedel-Crafts reaction; one-carbonelectrophiles (reactions: chloromethylation, Gatterman-Koch, Gatterman, Houben-Hoesch,Vilsmeier-Haack, Reimer-Tiemann, Kolbe-Schmitt); Ipso substitituion. Nucleophilic aromatic substitution: addition-elimination mechanism and evidences in favour of it; S_N1 mechanism; cine substitution (benzyne mechanism), structure of benzyne. Concept of organic acids and bases: effect of structure, substituent and solvent on acidity and basicity; proton sponge; comparison between nucleophilicity and basicity; application of thermodynamic principles in acid-base equilibria. Tautomerism: prototropy (keto-enol, nitro - aci-nitro, nitroso-oximino, diazo-amino and enamine-imine 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. Nucleophilic substitution reactions: substitution at sp3 centre[systems: alkyl halides, allyl halides, benzyl halides, alcohols, ethers, epoxides, α-halocarbonyls]:mechanisms (with evidence), relative rates& stereochemical features: S_N1, S_N2, S_N2', S_N1' (allylic rearrangement) and SNi; effects of solvent, substrate structure, leaving group and nucleophiles (including ambident nucleophiles, cyanide & nitrite); substitutions involving NGP (with hetero atoms and aryl groups); role of crown ethers and phase transfer catalysts. 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. Addition to C=C:mechanism (with evidence wherever applicable), reactivity, regioselectivity (Markownikoff and anti-Markownikoff additions) and stereoselectivity; reactions: hydrogenation, halogenation, hydrohalogenation, hydration, oxymercuration demercuration, hydroboration-oxidation, epoxidation, syn and anti-hydroxylation, ozonolysis, addition of singlet and triplet carbenes; Simmons-Smith cyclopropanation reaction;

						electrophilic addition to diene (conjugated dienes and allene); radical addition: HBr addition; mechanism of allylic and benzylic bromination in competition with brominations across C=C; use of NBS; Birch reduction of benzenoid aromatics; interconversion of E- and Z- alkenes; contra-thermodynamic isomerization of internal alkenes. Addition to C≡C (in comparison to C=C):mechanism, reactivity, regioselectivity (Markownikoff and anti-Markownikoff addition) and stereoselectivity; reactions: hydrogenation, halogenations, hydrohalogenation, hydration, oxymercuration demercuration, hydroboration-oxidation, dissolving metal reduction of alkynes (Birch); reactions of terminal alkynes by exploring its acidity; interconversion of terminal and non- terminal alkynes.
3	Organic Chemistry	CHEM-H-CC4-3-P	Organic Chemistry - Practical	Identification of Pure Single organic Compound	30	After the completion of this course, the student will be able to identify the following compounds: *Solid compounds*: oxalic acid, tartaric acid, succinic acid, resorcinol, urea, glucose, benzoic acid and salicylic acid. *Liquid Compounds*: methyl alcohol, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde, chloroform and nitrobenzene.

Scottish Church College

Department of Chemistry
Course Outcome (CCF)
Minor

SEM	Subject	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome
1/3	Inorganic Chemistry	CHEM-H-CC1-1-Th Or CHEM-H-CC1-3-Th	Fundamentals of Chemistry 1	Extra nuclear structure of atoms and Periodicity	15	After the completion of this course, the student will understand: Quantum numbers and their significance, Schrödinger's wave equation, significance of ψ and ψ^2. Radial and angular wave functions for hydrogen atom. Radial and angular distribution curves. Shapes of s, p, d and f orbitals. Pauli's Exclusion Principle, Hund's rules and multiplicity, Exchange energy, Aufbau principle and its limitations, Ground state Term symbols of atoms and ions. Modern IUPAC Periodic table, Effective nuclear charge, screening effects and penetration, Slater's rules, atomic radii, ionic radii (Pauling's univalent), covalent radii, lanthanide contraction. Ionization potential, electron affinity and electronegativity (Pauling's, Mulliken's and Allred-Rochow's scales) and factors influencing these properties, group electronegativities. Group trends and periodic trends in these properties in respect of s-, p- and d-block elements. Secondary periodicity, Relativistic Effect, Inert pair effect.
	Organic Chemistry			Basics of Organic Chemistry Bonding and Physical Properties	10	After the completion of this course, the student will understand: 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. MO theory: qualitative idea about molecular orbitals, bonding and antibonding interactions, idea about σ, σ*, π, π *, n – MOs; concept of HOMO, LUMO and SOMO; 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 [8] annulene (including mononuclear heterocyclic

						compounds up to 6-membered ring); concept of antiaromaticity and homoaromaticity; non-aromatic molecules; Frost diagram (qualitative drawing). Physical properties: influence of hybridization on bond properties: bond dissociation energy (BDE) and bond energy; bond distances, bond angles; concept of bond angle strain; melting point/boiling point and solubility of common organic compounds in terms of covalent & non-covalent intermolecular forces; polarity of molecules and dipole moments; relative stabilities of isomeric hydrocarbons in terms of heat of hydrogenation and heat of combustion data.
				Stereochemistry – 1	05	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, molecular chirality and centre of chirality; asymmetric and dissymmetric molecules; enantiomers and diastereomers; 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).
	Physical Chemistry			1. Thermodynamics – 1 2. Chemical Kinetics – 1	15	1st law of Thermodynamics: Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics; Concept of heat, work, internal energy and statement of first law; enthalpy, H; relation between heat capacities, calculations of q, w, ΔU and ΔH for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions; Joule's experiment and its consequence. Thermochemistry: Standard states; Heats of reaction; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; Laws of thermochemistry; bond energy, bond dissociation energy and resonance energy from thermochemical data, Kirchhoff's equations; Adiabatic flame temperature. Rate law, order and molecularity: Introduction of

						rate law, Extent of reaction; rate constants, order; Forms of rates of First, second and nth order reactions; Pseudo first order reactions (example using acid catalyzed hydrolysis of methyl acetate); Determination of order of a reaction by half-life and differential method; Rate determining step and steady-state approximation – explanation with suitable examples;), Opposing reactions, consecutive reactions and parallel reactions (with explanation of kinetic and thermodynamic control of products; all steps first order), Role of Temperature : Temperature dependence of rate constant; Arrhenius equation, energy of activation
1/3	Inorganic Chemistry	CHEM-H-CC1-1-P Or CHEM-H-CC1-3-P	Inorganic Chemistry (1) Lab	Acid and Base Titrations, Oxidation-Reduction Titrations:	30	After the completion of this course, the student will understand: Calibration of instruments, preparation of standard solutions, standardizations of secondary standard solutions, their uses and how to store them. Estimation of carbonate and hydroxide present together in mixture 2. Estimation of carbonate and bicarbonate present together in a mixture. 3. Estimation of free alkali present in different soaps/detergents. 1. Estimation of Fe(II) using standardized KMnO4 solution 2. Estimation of oxalic acid OR sodium oxalate in a given mixture 3. Estimation of Fe(II) and Fe(III) in a given mixture using $K_2Cr_2O_7$ solution. 4. Estimation of Fe(III) and Mn(II) in a mixture using standardized KMnO4 solution 5. Estimation of Fe(III) and Cu(II) in a mixture using K2Cr2O7.
2/4	Physical Chemistry	CHEM-H-CC2-2-Th Or CHEM-H-CC2-4-Th	Fundamentals of Chemistry -II	1. Kinetic Theory and Gaseous state 2. Real gas and Virial equation	15	After the completion of this course, the student will understand: 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); Wall collision and rate of effusion Nature of distribution of velocities, Maxwell's distribution of speeds in one, two and three dimensions; Kinetic energy distribution in one, two and three dimensions, calculations of average, root mean square and most probable values in each case; Calculation of number of molecules having energy $\geq \varepsilon$, Principle of equipartition of energy and its application to calculate the classical limit of molar heat capacity of gases 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, other equations of state (Berthelot, Dietrici); Existence of critical state, Critical constants in terms of van der Waals constants; Law of corresponding states; virial equation of state; van der Waals equation expressed in virial form and significance of second virial coefficient; Intermolecular forces (Debye, Keesom and London interactions; Lennard-Jones Potential)

	Inorganic Chemistry			Chemical Bonding – 1	15	(i) Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its application and limitations. Packing of ions in crystals. Born-Landé equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy. Defects in solids (elementary idea). Solubility energetics of dissolution process (ii) Covalent bond: Polarizing power and polarizability, ionic potential,Fazan's rules. Lewis structures, formal charge. Valence Bond Theory. The hydrogen molecule (Heitler-London approach), directional character of covalent bonds, hybridizations, equivalent and non-equivalent hybrid orbitals, Bent's rule, Dipole moments, VSEPR theory, shapes of molecules and ions containing lone pairs and bond pairs (examples from main groups chemistry) and multiple bonding (σ and π bond approach). (i) Molecular orbital concept of bonding (The approximations of the theory, Linear combination of atomic orbitals (LCAO)) (elementary pictorial approach): sigma and pibonds and delta interaction, multiple bonding. Orbital designations: gerade, ungerade, HOMO, LUMO. Orbital mixing, MO diagrams of H_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2, and their ions wherever possible; Heteronuclear molecular orbitals: CO, NO, NO^+ , CN^- , HF, BeH_2, CO_2 and H_2O. Bond properties: bond orders, bond lengths. (ii) Metallic Bond: Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids. (iii) Weak Chemical Forces: Hydrogen bonding (theories of hydrogen bonding, valence bond treatment), receptor-guest interactions, Halogen bonds. Effects of chemical force, melting and boiling points.
	Organic Chemistry			1. Stereochemistry – 2 2. General Treatment of Reaction Mechanism –1	15	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 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. Reactive intermediates: carbocations (carbenium

						and carbonium ions), non-classical cabocations, carbanions, carbon radicals, carbenes: generation and stability, structure using orbital picture and electrophilic/nucleophilic behavior of reactive intermediates (elementary idea). Reaction thermodynamics: free energy and equilibrium, enthalpy and entropy factor, calculation of enthalpy changes via BDE, intermolecular & intramolecular reactions. Reaction kinetics: rate constant and free energy of activation; 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 β-secondary kinetic isotopic effect (kH /kD); principle of microscopic reversibility; Hammond's postulate. Free-radical substitution reaction: halogenation of alkanes, mechanism (with evidence) and stereochemical features; reactivity-selectivity principle in the light of Hammond's postulate.
2/4	Analytical Chemistry	CHEM-H-CC2-3-P Or CHEM-H-CC2-4-P	General Chemistry Lab	Chemistry Practical	30	After the completion of this course, the student will understand: Basics of iodometry and iodimetry Standardization of $Na_2S_2O_3$ against standard dichromate solution (iodimetry) Estimation of Vitamin C 2. Estimation of (i) arsenite and (ii) antimony iodimetrically, Estimation of available chlorine in bleaching powder Estimation of Cu in brass. 2. Estimation of Cr and Mn in Steel. 3. Estimation of Fe in cement

Scottish Church College

Department of Chemistry

Course Outcome (CCF)

IDC

SEM	Subject	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome
1/2/3	Chemistry	CHEM-H-IDC1-1-Th or CHEM-H-IDC2-2-Th or CHEM-H-IDC3-3-Th	Quantitative Analysis and Basic Laboratory Practices	1. Introduction to Quantitative analysis and its interdisciplinary nature 2. Titrimetric analysis 3. Water analysis 4. Basic laboratory practices:	30	After the completion of this course, the student will understand: Definitions of analysis, determination, measurement, techniques and methods. Classification of analytical techniques. Choice of an analytical method -accuracy, precision, sensitivity. Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors. Statistical treatment of finite samples , mean, median, range, standard deviation and variance. External standard calibration -regression equation (least squares method), correlation coefficient (R2). Presentation of experimental data and results from the point of view of significant figures. Principle, classification, normality, molarity, molality, mole fraction, ppm, ppb etc. Standard solutions, preparation and dilution of reagents, preparation of ppm level solutions from source materials (salts). *Acid-base titrimetry:* Titration curves for strong acid vs strong base, weak acid vs strong base and weak base vs strong acid titrations. *Redox titrimetry:* Theory, balancing redox equations, titration curves. *Precipitation titrimetry*: Theory, titration curves, indicators for precipitation titrations. *Complexometric titrimetry*: Theory, titration methods employing EDTA (direct, back, displacement and indirect determinations). Indicators for EDTA titrations, Determination of hardness of water Water availability, requirement of water. Quality of surface water and ground water. Impurities in water. Standards of water quality for potable, domestic, industrial and agricultural purpose (color, pH, alkalinity, hardness, TDS, sulphate, fluoride, chloride etc.), House hold water treatment, municipal water treatment and industrial treatment (primary and secondary treatment of industrial effluent).Softening of water. Disinfection of water.

						Definition and determinations of DO, BOD and COD, and their significance. Basic laboratory practices, calibration of glassware (pipette, burette and volumetric flask), Sampling(solids and liquids), weighing, drying, dissolving, Acid treatment, Rules of work in analytical laboratory, General rule for performing quantitative determinations (volumetric and gravimetric), Safety in Chemical laboratory, Rules of fire prevention and accidents, First aid. Precautions to be taken while handling toxic chemicals, concentrated/fuming acids and organic solvents.
1/2/3	General Chemistry	CHEM-H-IDC1-1-Tu or CHEM-H-IDC2-2-Tu or CHEM-H-IDC3-3-Tu	Chemistry Tutorial	General Laboratory practices	15	After the completion of this course, the student will understand: 1. Safety Practices in the Chemistry Laboratory, knowledge about common toxic chemicals and safety measures in their handling, cleaning and drying of glass wares. 2. Calibration of glassware, pipette, burette and volumetric flask. 3. Preparation of TLC plates and separation of amino acids 4. Calibration of instruments like colorimeter, pH-meter, conductivity meter, spectrophotometer using reference/standards or reference materials. 5. Determination of alkali present in soaps / detergents.

Scottish Church College

Department of Statistics

Programme specific outcomes in CCF curriculum

Statistics Minor (offered with Four Year B.Sc. Honours programme)

The undergraduate students of University of Calcutta studying the four-year B.Sc. Honours programme in any Science discipline can choose Statistics as their Minor subject because of its standard and useful syllabus and may earn a maximum of 16 credits, at the end of the four-year B.Sc. Honours programme. Department of Statistics of Scottish Church College provides the option of choosing Statistics Minor at either first year (semester I & semester II) or second year (semester III & semester IV) and third year (semester V & semester VI). The syllabus for each semester consists of a total of 4 credits, of which 3 credits are for Theory and 1 credit is for Practical. The syllabus thoroughly covers descriptive statistics on both univariate and bivariate data, probability and standard probability distributions, statistical inference- estimation and testing of hypotheses, designs of experiments and sample survey. Students studying Statistics Minor have the opportunity to learn the fundamentals of exploratory data analysis and theoretical statistics, as rigorously as the students opting for four-year B.Sc. Honours with Statistics Major.

Statistics Interdisciplinary (offered with Four Year B.A./B.Sc. Honours/ Three Year B.A. Multidisciplinary programme)

The undergraduate students of University of Calcutta studying the four-year B.A. /B.Sc. Honours programme/ three-year B.A. Multidisciplinary programme can choose Statistics as their Interdisciplinary (IDC) subject because of its up-to-date and quite useful and lucrative syllabus and may earn 3 credits upon successful completion. Department of Statistics of Scottish Church College provides the option of choosing Statistics as the IDC subject at either semester I or semester II or semester III. The syllabus for each semester consists of a total of 3 credits, of which 2 credits are for Theory and 1 credit is for Practical. The syllabus for each semester is exactly same so that different students from the same or the different Honours/Multidisciplinary programmes have the opportunity to learn all the tools and techniques, which are necessary for the practitioners of Statistics in a comprehensive manner. The syllabus covers the basics of collecting and presenting data, summary measures related to univariate data, correlation and regression for bivariate data, standard tests of hypotheses, analysis of variance, sample survey and others, without the mathematical details. Successful completion of the Statistics IDC syllabus prepares the students of various humanities and science disciplines to collect and analyse data relevant to their own disciplines and interpret the results through appropriate statistical tools and techniques.

Scottish Church College

Department of Statistics

Course specific outcomes in CCF curriculum

Statistics Minor

Course: Descriptive Statistics I & Probability I
Course code: STAT-H-MC1-1 (for Semester I) / STAT-H-MC1-3 (for Semester III)

Area of study	Learning outcome
Statistics: Definition and scope. Concepts of statistical population and sample. *Data*: quantitative and qualitative, cross-sectional and time-series, discrete and continuous. *Scales of measurement*: nominal, ordinal, interval and ratio. *Presentation of data*: tabular and graphical. Frequency distributions, cumulative frequency distributions and their graphical representations. Stem and leaf displays.	Students will learn about what is Statistics and its scope of applicability and will be able to distinguish different types of data along with appropriate presentation tools.
Measures of Central Tendency: Mean, Median, Mode. *Measures of Dispersion*: Range, Mean deviation, Standard deviation, Coefficient of variation, Ginis Coefficient, Lorenz Curve. Moments, skewness and kurtosis. Quantiles and measures based on them. Box Plot. Outliers.	Students will learn the key features of any univariate data and the relevant summary measures in detail.
Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability: classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.	Students will learn about what is probability- the foundation of theoretical statistics and its various definitions along with some basic laws and theorems.

Course: Descriptive Statistics II & Probability II
Course code: STAT-H-MC2-2 (for Semester III) / STAT-H-MC2-4 (for Semester IV)

Area of study	Learning outcome
Bivariate data: Definition, scatter diagram, simple correlation, linear regression, principle of least squares, fitting of polynomial and exponential curves, correlation ratio, correlation index, intraclass correlation. *Rank correlation*: Spearman's and Kendall's measures.	Students will learn about bivariate data, its graphical presentation, several measures of correlation for continuous as well as ordinal variables, fitting of linear regression and other well-used curves.
Analysis of Categorical Data: Contingency table, independence & association of attributes.	Students will learn about categorical data along with a few measures of association.

Random Variables: Definition of discrete and continuous random variables, cumulative distribution function (c.d.f.) and its properties (without proof), probability mass function (p.m.f.) and probability density function (p.d.f.). Expectation and Variance. *Standard probability distributions*: Discrete Uniform, Binomial, Poisson, and Normal.	Students will learn about random variable and its probability distribution, cdf and pmf/pdf along with their properties in general and further some well-used discrete and continuous distributions and their fitting to real-life data.

Statistics Interdisciplinary

Course: Descriptive Statistics I & Probability I
Course code: STAT-H-IDC1-1/STAT-MD-IDC1-1 (for Semester I) / STAT-H-IDC2-2/STAT-MD-IDC2-2(for Semester II) / STAT-H-IDC3-3/STAT-MD-IDC3-3 (for Semester III)

Area of study	Learning outcome
Understanding univariate data: Variable, notion of population and sample, different types of data, methods of collecting primary and secondary data, presentation of data, summary measures on data with central tendency (arithmetic mean, median, mode), dispersion (range, quartile deviation, standard deviation, coefficient of variation), ideas of skewness and kurtosis (only through diagrams), Exploratory Data Analysis.	Students will learn different types of data and their presentation, will get ideas of population and sample, will be introduced to the some basic summary measures related to univariate data.
Understanding bivariate data: Paired data and ideas (without mathematical details) of different measures of associations, primarily Pearson's correlation coefficient, Spearman's Rank correlation (no tie), measures of association of attributes through contingency table, two-variable linear regression and multiple (three-variable only) linear regression (without derivation of the regression coefficients' formulae).	Students will learn about what is a paired data, basic measures of inter-relationship/ association between two variables/ attributes, linear regression for two variables.
Statistical Inference (*testing of hypothesis*): Basic idea of binomial and normal populations (graphical idea only, derivation of the properties excluded). Concepts of hypotheses, knowledge on test statistic and decision making in terms of critical value and p-value for some standard testing problems like test for proportion/proportions, mean based on single (normal) sample, test on comparing means based on two-sample and paired sample data.	Students will be introduced to some probability distributions - binomial and Gaussian, the idea of hypothesis and related matters including decision making through p-value in statistical inference followed by some standard tests for binomial proportion(s) and normal mean(s).
Miscellaneous discussion: Applications of one-way and two-way ANOVA with one observation per cell (without derivation and details) assuming normality, Kruskal-Wallis test (without derivation and details), sample size determination, estimation	Students will learn when and how to apply the anova technique for normal responses, the basic inference in sample survey, fitting of

of population mean and variability for finite population, idea and application of logistic regression for binary response data.	logistic regression and interpretation in case of binary responses.

Scottish Church College, kolkata
Department: Bengali

Course Outcome Under (CCF) of Bengali Honours

Semester I

Course Code	Course Name	Course Outcome
BNG-H-CC-1-1-TH-TU	History of Bengali Literature(up to 1800 AD)	The course introduces an idea of social and cultural history of mediaeval Bengal. The course develops knowledge about ancient Bengali literature and obscure religious cult)
BNG-H- MIN--1-1/3-TH-TU	History of Bengali Literature(up to 1800 AD)	The course introduces an idea of social and cultural history of mediaeval Bengal. The course develops knowledge about ancient Bengali literature and obscure religious cult)
BNG-H- IDC--1-1/2/3-TH-TU	Bengali Fiction and Drama	This course introduces fictions and dramas of different writers.
BNG-H- SEC--1-1-TH-TU	Print and Publication	Students will acquire primary knowledge about printing and publication.And news Reporting also.

Semester II

Course Code	Course Name	Course Outcome
BNG-H-CC-2-2-TH-TU	Linguistics	Basic idea and knowledge on linguistics,specially on morphology, phonetics and semantics,Bengali dialect
BNG-H- MIN--2-2/4-TH-TU	Linguistics	Basic idea and knowledge on linguistics,specially on morphology, phonetics and semantics,Bengali dialect
BNG-H- SEC--2-2-TH-TU	Byaboharik Bangla-1 /Practical Bengali	Students will develop their writing skill (diary , content writing, book review and translation)

Semester III

Course Code	Course Name	Course Outcome
BNG-H-CC-3-3-TH-TU	History of Bengali Literature (Modern)	The course introduces to different genres of Bengali literature from 19 th century.
BNG-H-CC-4-3-TH-TU	Bengali Literature: Primary Concept	Introduces literary texts – From ancient to contemporary Bengali poetry. Early novels and short story Drama and Prose writing.

BNG-H- SEC--3-3-TH-TU	Byaboharik Bangla-2 /Practical Bengali	This course will provide the fundamentals requiredby students who may choose career in theperforming arts; such as theatre, television and other medias.
BNG-H- MIN--1-1/3-TH-TU	History of Bengali Literature(up to 1800 AD)	The course introduces an idea of social and cultural history of mediaeval Bengal. The course develops knowledge about ancient Bengali literature and obscure religious cult)
BNG-AEC-1-3-TH	Essays and Terminology	This course is offered to students of all discipline. The course is to acquaint the students with essays and Terminology.

Semester IV

Course Code	Course Name	Course Outcome
BNG-H-CC-5-4-TH-TU	Pre-Modern Literature	This course introduces obscure religious poetry ofmediaeval Bengal.
BNG-H-CC-6-4-TH-TU	Bengali Detective literature, SF and supernatural stories	This course reintroduces the students to the alreadyfamiliar genres of Detective stories, SF andSupernatural ghost stories within a more theoretical model.
BNG-H-CC-7-4-TH-TU	Bengali Fiction 1	This course focuses on detailed study of some important Novel and short stories.
BNG-H- MIN--2-2/4-TH-TU	Linguistics	Basic idea and knowledge on linguistics,specially on morphology, phonetics and semantics,Bengali dialect
BNG-AEC-2-4-TH	Short stories and Poetry	This course is offered to students of all discipline.The course is to acquaint the students with poems and short stories.

Scottish Church College
Department of Botany
Lesson Plan (CCF)

Name of the faculty: Dr. Amitava Roy
IDC (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	IDC	PLANT AROUND US	INTRODUCTION	5	Students get to learn the history of Plant science & evolution	College Botany Studies sin Botany
II	IDC	PLANT AROUND US	INTRODUCTION	5	Students get to learn the history of Plant science & evolution	
III	IDC & SEC	PLANT AROUND US PLANT TISSUE CULTURE &hORTICULTURAL PRACTICES	INTRODUCTION & TYPES OF CULTURE TEHNIQUES	5 13	Students get to learn the history of Plant science & evolution Students get to learn the different types of cultures about their application	College Botany Studies sin Botany Plant Breeding, Biometry A Biotechnology

Name of the faculty: Dr. Rajyasri Ghosh

SEM	Course	Topic	Sub-Topic	No.	Learning	Reference

				of Lecture Hours	**outcom**	**books**

I	**i) DSC/Core BOT-H-CC1-1-T h** **DSC/ Core paper/ SEC (Botany):** **ii)BOT-H-SEC-1-Th** **BOT-H-SEC-1-P**	**PLANT DIVERSITY (THEORY)** **MUSHROOM CULTIVATIO N TECHNOLO GY (THEORY)** **MUSHROOM CULTIVATIO N TECHNOLO GY (Practical)**	**Fungi** **3.3 Economic importance of fungi (food, medicine and agriculture)** **1.3 Mushroom biology-classification of mushrooms, edible mushrooms in India, poisonous mushrooms,mushroom poisoning.** **4.1 Mushroom diseases and management strategies, 4.2 Post-harvest technology-short-term storage (Refrigeration- up to 24 hours), long-term storage (canning, pickles, papads etc.), drying, storage in salt solutions, 4.3 Food preparations from mushrooms.** **5. 5.1 Uses of spent mushroom substrate, 5.2Strain improvements in cultivated mushroom; Nutritional and medicinal value of edible mushrooms, 5.3 Research centres- National level and regional level, 5.4 Cost-benefit ratio, 5.5Mushroom based Industry, 5.6 Mushroom market in India and abroad** **1. Macro and microscopic identification of some common edible mushrooms (Agaricus, Pleurotus) 2. Media preparation 3. Fungal tissue culture 4. Sub-culturing for maintenance of culture 5. Spawn production 6. Cultivation of Pleurotus/Calocybe**	**3** **3** **9** **9** **30 h**	**Students can get a clear concept on economic importance of fungi** **Students can learn about different types of mushroom, edible one and poisonous ones** **Students can develop a clear idea on mushroom storage procedures and also the methods to protect the mushroom from fungal and bacterial pathogens during cultivation.** **Students can acquire knowledge on medicinal and nutritional importance of mushroom. Students can also learn about the mushroom marketing and cost and benefit ratio which will help them to have an idea if they want to initiate a start up.**	**21 st century Guidebook to Fungi by David Moore Hait, G., Ghosh, A. and Bhattacharya , K. A Text Book of Botany (Vols. I)** **Acharya,K., Roy, A. &Sarkar, J. Mushroom Cultivation Technology, 2020, Techno World, Kolkata.**

					Students can get hands on training experience on mushroom cultivation. This will help them to develop a skill on this technology and also they can acquire the knowledge on how to be an entrepreneur.	

II	**BOT-H-SEC-2-Th**	**BIOFERTILIZERS AND BIOPESTICIDES (THEORY)**	2.Nitrogen fixing bacteria as biofertilizers: 2.1 Rhizobium- Isolation, identification, mass multiplication, carrier-based inoculant formulation, filed application; 2.2 Azospirillum- Isolation, carrier-based inoculants, mass multiplication, associative effect of different microorganisms; 2.3 Azotobacter- Classification, characteristics, crop response to Azotobacter inoculants, maintenance and mass multiplication 6.Biopesticides – 6.1 Introduction; General features of potential biopesticides; Prospect and limitation; 6.2 Trichoderma: Isolation, mass production, formulation, quality control and field application; 6.3 Pseudomonas- Isolation, beneficial Pseudomonas strains in agriculture, mode of action; 6.4 Fungi as bioinsecticide- Metarhizium anisopliae, Beauveria bassiana and Verticillium lecaniioverview, mode of action and use in agriculture; 6.5 Nematophagous fungi-overview, mode of action	9 6	Students can get a clear concept on production and uses of nitrogen biofertilizer from nitrogen fixing bacteria Students can get a clear concept on production and uses of fungal biopesticides	
	BOT-H-SEC-2-P	**BIOFERTILIZERS AND BIOPESTICIDES (practical)**	1. Preparation of selective media for isolation of Azotobacter, phosphate- solubilizing microbes and Trichoderma. 2. Isolation and identification of phosphate-solubilizing fungi. 3. Study of Arbuscular Mycorrhizal fungi. 4. Isolation of Azotobacter and Trichoderma from the soil. 5. Evaluation of in vitro antagonistic activity of Trichoderma species in the dual culture system.	30	Students can get hands on training experience on isolation and identification of microbes used as biofertilizers and bio pesticides. This will help them to develop a skill on this technology and also they can acquire the knowledge on how to be an entrepreneur.	

						Acharya, K., Sen, S. & Rai, M. Biofertilizers and Biopesticides, 2019, Techno World, Kolkata.

III	**DSC/Core BOT-H-CC4-3-Th** **BOT-H-CC4-3-P**	**PLANT ANATOMY & EMBRYOLOGY (THEORY)** **PLANT ANATOMY & EMBRYOLOGY (Practical)**	1.3 Mechanical tissues and the principles governing their distribution in plants. 1.4 Stele: stelar types; leaf-trace and leaf-gap, 1.5 Stomata: origin and types (Metcalfe and Chalk, 1950; Stebbins and Khush, 1961). 2.2 Secondary growth: anomalous (stem of Bignonia, Boerhavia, Tecoma, Dracaena and root of Tinospora). Scope of plant anatomy: Application in systematics, forensics and pharmacognosy, 1. Microscopic studies on: Types of stomata, sclerenchyma and parenchyma cells, sclereids, raphides (Colocasia), cystolith (Ficus leaf) starch grains, aleurone grains, laticiferous ducts, oil glands. 2. Study of anatomical details through permanent slides/ temporary stained mounts- a) Root-Monocot and dicot, b) Stem-Monocot and dicot, c) Leaf-Isobilateral and Dorsiventral, d) Stelar types. 3. Study of anomalous secondary structure in stem of Bignonia, Boerhaavia, Tecoma, Dracaena and root of Tinospora 4. Study of adaptive anatomical features: Hydrophytes (Nymphaea – petiole), Xerophytes (Nerium – leaf) and Halophytes (Aegiceros corniculata- salt gland), Epiphytic root (Orchid - velamen).	6 4 1 30	Students can get a clear idea about stomata, stelar types and mechanical tissue distribution Students can clearly understand the anomalous secondary growth and its significance Students can learn to identify different types of plant tissue ; secretory, storage and ergastic matters in cell ; primay and secondary structure of root, stem and leaf ; anomalous secondary structure and adaptive anatomical features	i)Roy, P. Plant Anatomy, Latest Ed., New Central Book Agency ii) College Botany , Ganguly &Kar, Vol 1 iii) Fahn, A. Plant Anatomy (4th ed.), 1990, Wiley Eastern. College Botany Vol 1 practical

Name of the faculty: Dr. Srijita Ghosh
DSC/ Core paper COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books

I	BOT-H-CC1-1-Th Total marks 75; Credits 3, Class 45 hours	PLANT DIVERSITY	3.1 Salient features of Myxomycota, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina ‘ 6.1 Salient features of Cycadophyta, Coniferophyta and Gnetophyta, 6.2 Outline classification up to Division: Progymnospermophyta to Gnetophyta (Gifford & Foster 1989), 6.3 Economic importance (wood, resin, essential oil & drugs).	9	Upon completion of this course, students will gain an understanding of the salient features, classification, and distinguishing characteristics of the major fungal divisions, including Myxomycota, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, and Deuteromycotina. . Upon completion of this course, students will understand the salient features, classification, and economic importance of gymnosperms, including Cycadophyta, Coniferophyta, and Gnetophyta, with a focus on their uses in wood, resin, essential oils, and drugs.	1. Ganguli,H.C. , Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency 2. Hait, G., Ghosh, A. and Bhattacharya , K. A Text Book of Botany (Vols. I, II & III), 2007, New Central Book Agency 1.

II	**BOT-H-CC2-2-Th Total marks 75; Credits 3, Class 45 hours** **BOT-H-CC2-2-P Total marks 25; Credit 1, Class 30 hours 1.**	**PLANT SYSTEMATICS**	3. Systematic study of angiosperm taxa: Diagnostic features, systematic position (Bentham & Hooker) and economically important plants (parts used and uses) of the following families: 3.2. Dicotyledons: Nymphaeaceae, Magnoliaceae, Ranunculaceae, Leguminosae (subfamilies), Euphorbiaceae, Malvaceae, Umbelliferae (Apiaceae), Labiatae (Lamiaceae), Cruciferae (Brassicaceae), Solanaceae, Scrophulariaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Compositae (Asteraceae). (15 lectures) 1. Work out, description, preparation of floral formula and floral diagram, identification up to genus with the help of suitable literature of wild plants and systematic position according to Benthum and Hooker system of classification from the following families: Malvaceae, Leguminosae (Papilionaceae), Solanaceae, Scrophulariaceae, Acanthaceae, Labiatae (Lamiaceae), Rubiaceae. 2. Spot identification (Binomial, Family) of common wild plants from families included in the theoretical syllabus . FIELD WORK At least three excursions including one excursion to Acharya Jagadish Chandra Bose Indian Botanic Garden (Shibpur, Howrah) and one to Central National Herbarium (CNH). FIELD RECORDS 1. Field Note Book (authenticated) with field notes on the plants of the area of excursion and voucher specimen book. 2. Herbarium specimens: Preparation of 20 angiospermic specimens (identified with author citation, voucher number and arranged following Bentham and Hooker system of classification) to be submitted during examination.	15 30	Students will develop a thorough understanding of the diagnostic features, systematic position, and economic importance of various angiosperm families, focusing on both monocots and dicots. They will gain practical skills in preparing floral formulas and diagrams, identifying wild plants to the genus level, and applying Bentham and Hooker's classification system. Additionally, students will gain hands-on experience through fieldwork and herbarium specimen preparation, enhancing their plant identification and documentation skills.	Singh, G. Plant Systematics: An Integrated Approach (3rd ed.), 2016, CRC Press 2. Lawrence, G.H.M. Taxonomy of Vascular Plants Ed., Oxford & IBH.

III	**BOT-H-CC3-3-Th Total Marks 75, Credits 3, Lectures 45 hours**	**ECONOMIC BOTANY**	**Vegetables and fruits:** **5.1** Vegetables: Scientific names, family and edible parts- Potato, Pointed gourd, Brinjal, Tomato, Cauliflower, Cabbage, Lady´s finger, Ridge gourd, Cucumber, Spinach, Carrot, Pea, Beans, Drumstick, Radish and Sweet potato, 5.2 Fruits: Scientific names, family, types of fruits and edible parts: Mango, Papaya, Custard apple, Pineapple, Tamarind, Jackfruit, Banana, Guava, Pomegranate, Apple, Strawberry, Wood apple, Litchi and Grapes.	4	Upon completion of this course, students will be able to identify and classify common vegetables and fruits based on their scientific names, families, and edible parts. They will gain knowledge of the types of fruits and vegetables and understand their botanical characteristics. Students will also develop an understanding of the nutritional and economic importance of these plants.	1. Mitra, D., Guha, J., Chowdhuri, S.K. Studies in Botany, Vol. II, latest Ed. D.N. Moulik for Moulik Library. 2. Kochhar, S.L. 2012. Economic Botany in Tropics, MacMillan & Co. New Delhi, India
	BOT-H-SEC-3-Th Total Marks 75, Credits 3, Lectures 45 hours	**PLANT TISSUE CULTURE AND HORTICULTURE PRACTICES**	**B. Horticulture Practices (25 marks)** **1 Horticulture: 4 Lectures** 1.1 Scope, importance and branches, 1.2 Role in rural economy and employment generation, 1.3 Harvesting and handling of fruits, vegetables and cut flower; methods of preservation and processing, 1.4 Urban horticulture and ecotourism. **2. Horticultural techniques: 3 Lectures** 2.1 Application of manures, fertilizers, nutrients and PGRs, 2.2 Weed controls, biofertilizers, biopesticides, irrigation methods, 2.3 Hydroponics, propagation methods: vegetative (grafting, cutting, layering, budding), sexual (seed production), scope and limitations.			1.Singh, D. &Manivannan, S. 2009. Genetic Resources of Horticultural Crops. Ridhi International, Delhi, India. 2. Swaminathan, M.S. and Kochhar, S.L. 2007. Groves of Beauty and Plenty: An Atlas of Major Flowering Trees in India. Macmillan Publishers, India..

					Students will gain a comprehensive understanding of horticulture's scope, importance, and its impact on rural economies and employment. They will learn essential horticultural techniques, including crop management, pest control, and modern practices like hydroponics and propagation methods. Students will also develop knowledge of harvesting, preservation, and the role of horticulture in urban settings and ecotourism.	

IDC (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books

I	IDC Total marks 50; Credits 2, Class 30 hours	Plants around us (Theory)	Plants and human health: 5.1 lmportant medicinal plants and their uses- basak (lusticio odhotodo), ghritakumari (Aloe vero), cinchona (Cinchona officinolisl, neem (Azodirochto indico), kalmegh (Andrographis poniculoto), pudina (Mentho orvensisl, tulsi (ocimum sanctum), sarpagandha (Rauvolfia serpentina);5.2 Plant-derived medicinal compounds and uses (Quinine, Reserpine, Vincristine, Curcumin, Gingerol).	5	The course aims to provide knowledge on important medicinal plants, their uses, and plant-derived compounds with therapeutic applications.	Studies in Botany {vol-l)- J.N,Mitra, Dehahrata Mitra & Salil Chowdhury (Moulik Library)
	IDC-Prac Total marks 25; Credit 1, Class 30 hours	(Practical)	ldentification: Morphological study plant speclmens Microscopic study - Nostoc, Oedogonium (with oogoniu m), Rhizopus, Penicillium (sporangiophore). Macroscopic study - Agoricus (fruit body), Morchantiq with gemma cup, antheridiophore/ archaegoniophore, Moss sporophyte, Pteris (fertile leaf/pinna), Pinus - male and female cone. Fruits of tomato, peas, cucumber, citrus, apple & banana. Work out of flower: Floral parts of Hibiscus roso-sinensis, Clitoria ternateo & Doturq metel.	8	The course provides practical skills in identifying plant specimens through morphological, microscopic, and macroscopic studies, focusing on various plant structures and fruits.	

II	IDC	IDC Total marks 50; Credits 2, Class 30 hours	2.Plants and ecosystem: 3.1 Phytodiversity and conservation;3.2 Biodiversity hotspots of lndia; 3.3 Forest types in lndia; 3.4 Plant-based adaptations to climate change; 3.5 Concept of 'Carbon footprint'- role of plants in reducing carbon footprint 4. Plants and human health: 5.1 lmportant medicinal plants and their uses- basak (lusticio odhotodo), ghritakumari (Aloe vero), cinchona (Cinchona officinolisl, neem (Azodirochto indico), kalmegh (Andrographis poniculoto), pudina (Mentho orvensisl, tulsi (ocimum sanctum), sarpagandha (Rauvolfia serpentina);5.2 Plant-derived medicinal compounds and uses (Quinine, Reserpine, Vincristine, Curcumin, Gingerol).	10	The course explores plant diversity, conservation, climate change adaptations, and the role of plants in reducing carbon footprints, with a focus on India's biodiversity hotspots and forest types. The course aims to provide knowledge on important medicinal plants, their uses, and plant-derived compounds with therapeutic applications.	Studies in Botany {vol-l)- J.N,Mitra, Dehahrata Mitra & Salil Chowdhury (Moulik Library)
		IDC-Prac Total marks 25; Credit 1, Class 30 hours	ldentification: Morphological study plant speclmens Microscopic study - Nostoc, Oedogonium (with oogoniu m), Rhizopus, Penicillium (sporangiophore). Macroscopic study - Agoricus (fruit body), Morchantiq with gemma cup, antheridiophore/ archaegoniophore, Moss sporophyte, Pteris (fertile leaf/pinna), Pinus - male and female cone. Fruits of tomato, peas, cucumber, citrus, apple & banana.	8	The course provides practical skills in identifying plant specimens through morphological, microscopic, and macroscopic studies, focusing on various plant structures and fruits.	

			Work out of flower: Floral parts of Hibiscus roso-sinensis, Clitoria ternateo & Doturq metel.			
III	IDC	IDC-Prac Total marks 25; Credit 1, Class 30 hours	ldentification: Morphological study plant speclmens Microscopic study - Nostoc, Oedogonium (with oogoniu m), Rhizopus, Penicillium (sporangiophore). Macroscopic study - Agoricus (fruit body), Morchantiq with gemma cup, antheridiophore/ archaegoniophore, Moss sporophyte, Pteris (fertile leaf/pinna), Pinus - male and female cone. Fruits of tomato, peas, cucumber, citrus, apple & banana. Work out of flower: Floral parts of Hibiscus roso-sinensis, Clitoria ternateo & Doturq metel.	8	The course provides practical skills in identifying plant specimens through morphological, microscopic, and macroscopic studies, focusing on various plant structures and fruits.	

Minor COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
III	BOT-H-CC1-1-Th Total marks 75; Credits 3, Class 45 hours	PLANT DIVERSITY	3.1 Salient features of Myxomycota, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina .1 Salient features of Cycadophyta, Coniferophyta and Gnetophyta, 6.2 Outline classification up to Division: Progymnospermophyta to Gnetophyta (Gifford & Foster 1989), 6.3 Economic importance (wood, resin, essential oil & drugs).	9	Upon completion of this course, students will gain an understanding of the salient features, classification, and distinguishing characteristics of the major fungal divisions, including Myxomycota, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, and Deuteromycotina. . Upon completion of this course, students will understand the salient features, classification, and economic importance of gymnosperms, including Cycadophyta, Coniferophyta, and Gnetophyta, with a focus on their uses in wood, resin, essential oils, and drugs.	1. Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency 2. Hait, G., Ghosh, A. and Bhattacharya, K. A Text Book of Botany (Vols. I, II & III), 2007, New Central Book Agency

Name of the faculty: Dr. Nilanjan Chakraborty
DSC/ Core paper COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books

I	DSC 1	Fungi	3.3 Economic importance of fungi (food, medicine and agriculture), 3.4 Fungal symbioses: Mycorrhiza, Lichen and their importance.	3	Students will learn different food and medicine prepared from fungi. They will also get the knowledge about the use of fungi in agriculture. They will also know different types of association that will help to learn our ecosystem.	Ganguli,H.C. and Kar, A.K. College Botany, Vol. II, latest Ed., New Central Book Agency
		Angiosperms	Inflorescence types with examples, 7.3 Flower: Different parts and forms of calyx, corolla, androecium and gynoecium; aestivation and placentation,	6	From this study students will gain knowledge about different parts of flower.	Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency
	SEC	Mushroom Cultivation Technology (Theory and Practical)	2.1 Infrastructure-structural design and layout of mushroom farm, substrates (locally available), 2.2 Appliances-weighing balance, autoclave, laminar air flow, incubator,hot air oven, spirit lamp, bunsen burner, pH meter,laboratory heater, low-cost stoves, water bath, humidifier, water sprayer,vessels, inoculation hook and inoculation loop, sieves, culture racks,tray,polythene bags, 2.3 Methods of sterilization. (9 lectures) 3. 3.1 Cultivation technology-overview of cultivation strategies,composting technology in	15	Students will learn different aspects of mushroom cultivation. Requirements and processes of mushroom cultivation including medicinal mushrooms. In practical, process of cultivation helps the students to startup a business.	Acharya,K., Roy, A. &Sarkar, J. Mushroom Cultivation Technology, 2020, Techno World, Kolkata. K., Sen, S. & Rai, M. Biofertilizers and Biopesticides, 2019, Techno World, Kolkata.

			mushroom production,mushroom bed preparation,culture media,pure culture, maintenance and preservation of pure culture, 3.2Production of spawn- cultivation of oyster mushroom, paddy-straw mushroom, milky mushroom and white button mushroom, 3.3 Cultivation of medicinal mushroom (Cordyceps and Ganoderma). (12 lectures)			
II	SEC	Biofertilizers And Biopesticides (Theory and Practical)	1.1 General account and components of organic farming; microbes used as biofertilizers, general account on mass production of biofertilizers; 1.2 Manure- Green manuring and organic fertilizers;types and methods of composting; vermicompost and field applications; recycling of biodegradable municipal, agricultural and industrial wastes. 1.4 Mycorrhizal association- 4.1 Types of mycorrhizal association, phosphorus nutrition, growth and yield; 4.2 colonization of VAM – isolation and inoculum production of VAM and its influence on growth and yield of crop plants.	14	Students will learn different aspects of Biofertilizers and green manuring. In practical, process of isolation of different microbes helps the students to startup a business.	

III	CC4	Plant Anatomy	1.1 Cell wall: ultrastructure, chemical constituents; thickening of cell wall. 3.2 Adaptive anatomical features of hydrophytes, xerophytes, halophytes.	2 3	Students will learn about the structure and functions of cell wall. Students will learn about adaptations of plants in different habitats.	Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency

IDC (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	NA					
II	NA					
III	NA					

Minor COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	NA					
II	NA					
III	MDC 1	Angiosperms	Inflorescence types with examples, 7.3 Flower: Different parts and forms of calyx, corolla, androecium and gynoecium; aestivation and placentation,	6	From this study students will gain knowledge about different parts of flower.	Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency

Name of the faculty: Dr. Satabdi Ghosh
DSC/ Core paper COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	BOT-H-CC1-1-Th	Angiosperms	Types and morphology of leaf, stem and root, Inflorescence types with examples, Flower: Different parts and forms of calyx, corolla, androecium and gynoecium; aestivation and placentation, Types with examples-fruits and seeds.	10	Morphology is the study of the external features of plants. In morphology, we study the general appearance of any organism, such as size , shape, and structure. Morphology provides us with the basis for the understanding of function , taxonomy , heredity , ecology , development and other branches of biology , therefore gives us a platform to study other branches	Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency
II		Introduction	Components of Systematics: Nomenclature, Identification, Classification; 1.2. Taxonomy and its phases - Pioneer, Consolidation, Biosystematic and Encyclopaedic; alpha- and omega- taxonomy, 1.3 Nomenclature: Type method, Publication, Rank of taxa, Rules of priority, Retention and rejection of names, Author Citation, Effective and valid publication, Elementary knowledge of ICN-Principles.	10	Students will gain knowledge on the basics of plant taxonomy, its phases, and the different rules flowed in plant taxonomy during the publication of newly discovered plants.	Paria, N.D., Plant Taxonomy & Biodiversity, 2022, Santra Publication Pvt. Ltd. Naik, V.N. Taxonomy of Angiosperms, Latest Ed., Tata McGraw Hill Dutta, S.C. Systematic Botany, Latest Ed., Wiley Eastern Singh, G. Plant Systematics: An Integrated Approach (3rd ed.), 2016, CRC Press
		Systems of classification:	Broad outline of Bentham & Hooker (1862-1883) and Takhtajan (1997)- systems of classification with merits and demerits. Brief idea of angiosperm phylogeny group (APG IV classification)	4	Students will study all the classifications followed till date with reasons in plant taxonomy	
		Data sources in Taxonomy	Supportive evidence from Phytochemistry, Cytology, Palynology, and Molecular Biology Data (Protein and Nucleic Acid Homology).	5	Students will know about different parameters followed during identification of taxa and solving taxonomic problems	

		PLANT SYSTEMATICS PRACTICAL	Work out, description, preparation of floral formula and floral diagram, identification up to genus with the help of suitable literature of wild plants and systematic position according to Benthum and Hooker system of classification		Students will gain experience on dissection of flowers and study the internal reproductive structures of plants.	
III	DSC-CORE BOT-H-CC4-3-TH	PLANT ANATOMY	TISSUES: Meristems and complex tissues	2	Students get an idea about the structure and function of plant cells, tissues, and organs. They can relate to the organization of the shoot apex to plant growth and development patterns. They learn about using plant anatomical features to analyze evidence in forensic investigations (e.g., wood identification, plant fragments) and also to analyze tree-ring patterns to determine age, growth rates, and environmental conditions.	Fahn, A. Plant Anatomy (4th ed.), 1990, Wiley Eastern. Roy, P. Plant Anatomy, Latest Ed., New Central Book Agency
			PRIMARY AND SECONDARY GROWTH: Primary structure of ste, root—monocot and dicot; leaf—dorsiventral and isobilateral Secondary growth: normal (intra & extra stelar)	4		
		DEVELOPMENTAL AND ECOLOGICAL ANATOMY	oRGANISATION OF SHOOT APEX (tUNICA-cORPUS) and root apex (Korper-Kappe),Plastochon	2		
		Scope of plant anatomy	Application in systematics, forensics, brief idea of dendrochoronology	3		

	BOT-H-SEC-3 TH	PLANT TISSUE CULTURE AND PLANT REGENERATION	Requisites of Plant Tissue Culture and Plant Regeneration: Requirement of plant tissue culture Laboratory: Equipment, instruments, Glasswareand Plasticwares, Aseptic technique: contaminants and sterilization, Plant tissue culture medium: media preparation *(basal media), gelling agents, and their uses, Use of plant growth regulators in plant tissue culture, cellular totipotency, Organogenesis (direct and indirect), Somatic embryogenesis and its significance, artificial seed (encapsulation and its potential use)	8	They learn about the principles and techniques of plant tissue culture, including sterilization, media preparation, and explant selection.They study about processes of plant regeneration, including somatic embryogenesis and organogenesis.	Dey, K.K. Plant Tissue Culture, 1992, New Central Book Agency Jha, T.B. & Ghosh, B. Plant Tissue Culture, 2003, Universities Press

IDC (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
III		Plants around us	Identification: Morphological study plant specimens Microscopic study: Nostoc, Oedogonium (with oogonium), Rhizopus, Penicillium (sporangiophore). Macroscopic study: Agoricus (fruit body), Morchantiq with gemma cup, antheridiophore/archaegoniophore, Moss sporophyte, Pteris (fertile leaf/pinna), Pinus (male and female cone). Fruits of tomato, peas, cucumber, citrus, apple & banana. Work out of flower: Floral parts of Hibiscus roso-sinensis, Clitoria ternateo & Doturq metel.	30	Students learn about both crypyograms and phanerograms (microscopic and macroscopic view). They also study about different fruits. They also dissect flowers and study about the accessory andreproductive whorls	College Botany (vol ll)-H.c. Gangulee, A.K. Kar, S.c. santra (New central Book Agency)

Lesson Plan (CCF)

Name of the faculty: Dr. Biplab Kumar Bhowmick

DSC/ Core paper COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	BOT-H-CC1-1-Th Total marks 75; Credits 3, Class 45 hours	PLANT DIVERSITY (PRACTICAL) BOT-H-CC1-1-P Total marks 25; Credit 1, Class 30 hours	1.Introduction to plant kingdom. 1.2 Importance of plants as source of food, fuel and their role in ecosystem services (as carbon sink, sequestering etc.) 5. Pteridophytes Identification on the basis of reproductive and structural features from preserved specimens/ permanent slides:	9	Studets are acquainted with plant diversity and their gross uses Also, they gain specific knowledge on pteridophytes and their taxonomy and economic uses Students will gain experience on identification of specimens of different plan groups	Ganguli,H. C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency
III	BOT-H-CC4-3-Th	PLANT ANATOMY & EMBRYOLOGY (THEORY)	EMBRYOLOGY (25 marks) 1. Pre-fertilisation and post- fertilization changes 2. Embryo development and apomixis	15	Students will learn the basics of double fertilization, germline cells of plants, endosperm function and apomictic pathways to develop a wholesome view of embryonal growth	Maheswari, P. An Introduction to Embryology of Angiosperm, Latest Ed., Tata McGraw Hill.

IDC (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	IDC	Plants around us (Practical)	1. Identification of macroscopic specimens from different plant groups and observation of microscopic slides of Nostoc, Oedogonium, Rhizopus, Penicillium 2. Work out on flowers of Datuta, Crotalaria, Hibiscus	10	Taxonomic understanding of different plant groups and hands on experience on floral biology work out	
III	IDC	Plants around us (Theory)	3. Plants and ecosystem 4. Plants and society	15	The concept of phytodiversity, adaptation and phytoremediation will be learnt by students coming form diverse major paper courses. They will enjoy the experience of learning the utility of plants in daily life and their role in economic growth of country.	ECONOMIC BOTANY, Singh, Pandey and Jain, Rastogi Publications, Ecology and utilization of plants, P.D. Sharma, Rastogi publication.

Minor COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
III	BOT-H-CC1-1-Th Total marks 75; Credits 3, Class 45 hours	PLANT DIVERSITY	1.Introduction to plant kingdom. 5. Pteridophytes 2. Algae	9	Studets are acquainted with plant diversity and their gross uses Also, they gain specific knowledge on algae and pteridophytes and their taxonomy and economic uses	Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency

Name of the faculty: Camellia Nandi

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	PLANT DIVERSITY (THEORY) BOT-H-CC 1-1-Th	1.Introduction to plant kingdom. 1. Algae	1.1 Origin of life and evolution of plant cells, 1.2 Importance of plants as source of food, fuel and their role in ecosystem services (as carbon sink, sequestering etc.) 2.1. Salient features of Cyanophyceae, Chlorophyceae, Charophyceae, Phaeophyceae, Rhodophyceae and Bacillariophyceae 2.2 Criteria and system of classification (Fritsch, 1935) 2.3. Economic importance of algae in environment, agriculture, biotechnology and industry.	3+ 6=9	● Students will learn about how the first life forms originated and evolved through time and how plants serve as sources of energy, food etc. This will clear their concept on the significance of plants. ● They will learn about the basic concept of algal groups, their characteristic features, and their economic importance.	1. Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency 2. Ganguli,H.C. and Kar, A.K. College Botany, Vol. II, latest Ed., New Central Book Agency 3. Mukherjee, S. College Botany, Vol. III, latest Ed., New Central Book Agency

	PLANT DIVERSITY (THEORY) BOT-H-CC 1-1-Pr	PLANT DIVERSITY	1. Flower- dissection, drawing and study a) Different parts, b) Adhesion and cohesion, c) Placentation, d) Aestivation 2. Study of ovules: types (Fresh specimens/ permanent slides/ photographs) 3. Fruits:different types- study from fresh/ preserved specimens 4. Inflorescence types: study from fresh/ preserved specimens 5. Identification on the basis of reproductive and structural features from preserved specimens/ permanent slides: Algae (*Nostoc, Oedogonium and Ectocarpus*), Fungi (*Rhizopus, Ascobolus and Agaricus*), Bryophytes (*Marchantia, Anthoceros and Funaria*), Pteridophytes (*Selaginella, Equisetum and Pteris*), Gymnosperms (male cone and female cone/ megasporophyll of *Cycas, Pinus and Gnetum*).	30	● JK ● The experminents will clarify dissection of flower parts, their placentation, fruits, inflorescence types. ● The experiments will help identify representative genera of algae, fungi, bryophyte , pteridophyte and gymnosperms. ● The field visit will give the students the hands-on knowledge to identify inflorescence, flowers and fruits in nature.	

			6. A field notebook supported with photographs taken during field study to be submitted giving comprehensive idea about different types of inflorescence, flowers and fruits.			
	CVAC 1: ENVS01: Fundamentals of Environment	Unit 2: Ecology and Ecosystems	1. Concept of ecology, ecosystem, and ecosystem services 2. Structure and function of ecosystem 3. Energy flow in an ecosystem . 4. Ecological pyramid, food chain and food web (Terrestrial and aquatic ecosystems) 5. Basic concept of population and community ecology . 6. Ecological succession	1	● This will clarify all the basic concepts of ecology and ecosystem, their structure, function, energy flow, population ecology and succession.	Das. S., (2023) Environmental Education, Sanjib Prakasan, Kolkata

I	IDC Botany: Plants Around Us (Practical)	Plants Around Us	1. Identification: Morphological study plant specimens Microscopic study - *Nostoc, Oedogonium* (with oogonium), *Rhizopus, Penicillium* (sporangiophore). Macroscopic study - *Agaricus* (fruit body), *Marchantia* with gemma cup, antheridiophore / archaegoniophore, Moss sporophyte, *Pteris* (fertile leaf/pinna), *Pinus* - male and female cone. Fruits of tomato, peas, cucumber, citrus, apple & banana. Work out of flower: Floral parts of *Hibiscus rosa-sinensis, Clitoria ternatea & Dottura metel*.	30	● The experminents will clarify dissection of flower parts. ● The experiments will help identify representative genera of algae, fungi, bryophyte, pteridophyte and gymnosperms.	1.Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency 2.Ganguli,H.C. and Kar, A.K. College Botany, Vol. II, latest Ed., New Central Book Agency 3. Mukherjee, S. College Botany, Vol. III, latest Ed., New Central Book Agency
II	PLANT SYSTEMATICS (BOT-H-CC 2-2-Th)	3.Monocotyledons	3.1. Monocotyledons: Alismataceae, Gramineae (Poaceae), Cyperaceae, Palmae (Arecaceae), Liliaceae, Musaceae, Zingiberaceae, Cannaceae, Orchidaceae	5	1. Students will learn about the characters of the monocot families and their economic importance, and current status.	1.Singh, G. Plant Systematics: An Integrated Approach (3rd ed.), 2016, CRC Press 2. Simpson, G. Plant Systematics, 2006, 2010, 2019, Springer

II	BIOFERTILIZERS AND BIOPESTICIDES (THEORY) BOT-H-SEC-2-Th	Biofertilizers and Biopesticides	3.1 Cyanobacteria (Blue green algae), *Azolla and Anabaena* azollae association, nitrogen fixation,factors affecting growth, blue green algae and *Azolla* in rice cultivation. 3.2 Actinorhizal symbiosis- Actinorhizal plants, infection process, isolation of *Frankia.* 6.1 Bacteria as bioinsecticide- *Bacillus thuringiensis* -Characterization, mass production and field application; 6.2 Virus as bioinsecticide- Baculovirus- characterization, bioformulation, mass production and field application.	8	1. Use of Cyanobacteria, *Azolla,* Actinorhiza, *Frankia* as biofertilizer and their application in field. 2.Use of Bacteria and virus as bioinsecticide	Acharya, K., Sen, S. & Rai, M. Biofertilizers and Biopesticides, 2019, Techno World, Kolkata.

II	CVAC 2: Lifestyle Diseases and Their Prevention	Lifestyle Diseases and Their Prevention	1.lntroduction to Lifestyle Diseases: Definitions and classifications Causes and consequences of obesity; Diabetes mellitus: types, risk factors, and management. Cardiovascular Diseases: Heart disease and hypertension; Role of diet and exercise in heart Health. 2.Dietary Guidelines; Meal planning for health	4	1. Define lifestyle diseases and distinguish them from other health conditions. 2. ldentify common lifestyle-related diseases, their risk factors, and prevalence. 3. Analyze the impact of nutrition, physical activity, sleep, and stress management on health. 4. Evaluate the role of public health initiatives in promoting healthier lifestyles. 5. Create a personalized plan for improving their own lifestyle and preventing lifestyle Diseases.	1. The 4 Pillar Plan" by Dr. Rangan Chatterjee 2."How Not to Die" by Michael Greger, M.D., and Gene Stone

Name of the faculty: Dr. Shuvadeep Majumdar

DSC/ Core paper COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	BOT-H-CC1-1-Th Total marks 75; Credits 3, Class 45 hours	PLANT DIVERSITY (PRACTICAL) BOT-H-CC1-1-P Total marks 25; Credit 1, Class 30 hours	**4. Bryophytes** 4.1 Salient features of Hepaticopsida, Anthocerotopsida and Bryopsida, 4.2. System of classification up to Class (Proskauer 1957), 4.3. Amphibian nature of bryophytes, 4.4 Economic and ecological importance. 1. Flower- dissection, drawing and study a) Different parts, b) Adhesion and cohesion, c) Placentation, d) Aestivation 2. Study of ovules 3. Fruits: different types 4. Inflorescence types	16	Students are acquainted with bryophyte features, diversity, their nature, classification, economic and ecological importance. Students will gain experience on flower dissection, types of aestivation, placentation, ovules, fruit types and different types of inflorescence.	Ganguli, H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vol. I)

III	BOT-H-CC3-3-Th Total marks 75; Credits 3, Class 45 hours (PRACTICAL) BOT-H-CC3-3-P Total marks 25; Credit 2, Class 30 hours	ECONOMIC BOTANY	**1. Origin of cultivated crops:** Concepts of centre of origin, their importance with reference to Vavilov's work. Examples of major plant introductions; crop domestication and loss of genetic diversity; evolution of new crops/ varieties, importance of germplasm diversity. **2. Cereals, pulses, oils and rubber:** 2.1 Cereals: Rice, Wheat, Jowar and Bajra (cultivation, processing and uses), Millets as future cereals. Origin of Rice and Wheat. 2.2 Pulses and Legumes: Cultivation and uses of Gram, Mung Bean and Soyabean. Importance to man and environment. 3. **Sugar, starch, spices and beverages:** 3.2 Spices and condiments: Scientific names, family, economically important parts and uses of Ajwain, Cumin, Black Cumin, Mustard, Fenugreek, Coriander, Chillies, Bay leaf, Black Pepper, Cardamom (small and big), Clove, Cinnamon, Onion, Garlic and Ginger. Identification of economically important plants: Cereals: Rice and Wheat Legume: Gram, Mung bean and Soybean (habit, fruit and seed structure) Spices and condiments: Coriander, Cumin, Bay leaf, Black pepper, Cinnamon Tea and coffee (plant habit and parts used)	32	Students are acquainted with origin of cultivated crops, cereals, pulses, spices and condiments. Students will gain experience on identification of economically important plants.	Kochhar, S.L. 2012. Economic Botany in Tropics, MacMillan & Co. New Delhi, India Simpson, B.B. and Conner-Ogorzaly, M. 1986. Economic botany: plants in our world. Mitra, D., Guha, J., Chowdhuri, S.K. Studies in Botany, Vol. II, latest Ed. D.N. Moulik for Moulik Library.

			Common vegetables: Potato, Cucumber, Brinjal, Lady´s finger, Carrot, Sweet potato Fruits (only the type of fruit) Fibres: jute and cotton (plant and parts used)			

III	BOT-H-SEC-3-Th Total marks 75; Credits 3, Class 45 hours	PLANT TISSUE CULTURE AND HORTICULTURE PRACTICES (PRACTICAL) BOT-H-SEC-3-P Total marks 25; Credit 1, Class 30 hours	**3. Ornamental plants:** 3.1 Types, classifications (annuals, perennials, climbers and trees), 3.2 Identification and salient features of 3.2.1 Some ornamental flowers (rose, marigold, gladiolus, carnations, rasna orchid, gerberas, tuberose, birds of paradise, pin cushion cactus and desert rose), 3.2.2 Ornamental flowering trees (Indian laburnum, gulmohar, jacaranda, jarul, fishtail palm, simul, coral tree), 3.2.3 Bonsai and their commercial use, 3.2.4 Importance of flower shows and exhibitions. **4. Fruit and vegetable crops**: 4.1 Some common fruits and vegetables- description of plants and their economically important parts (orange, banana, mango, papaya, guava, litchi, bael, potato, cauliflower, carrot, onion, peas, brinjal, ridged gourd), 4.2 Fruit processing- scope and benefit. 2. Media preparation, sterilization and aseptic inoculation of explant for seed culture. 3. Propagation of two horticulturally important plants . 4. Identification of ornamental flowers as per theoretical syllabus.	28	Students are acquainted with ornamental plants, bonsai, various fruits and vegetables crops, fruits processing. Students will gain experience on media preparation, sterilization and aseptic inoculation of explant for seed culture and identification of ornamental flowers.	Jha, T.B. & Ghosh, B. Plant Tissue Culture, 2003, Universities Press Kar, D.K. & Halder, S. Plant Breeding, Biometry & Biotechnology, 2010, New Central Book Agency Dey, K.K. Plant Tissue Culture, 1992, New Central Book Agency

IDC (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I						
II						
III						

Minor COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
III	BOT-MD-CC3-3-Th	Plant diversity	**4. Bryophytes** 4.1 Salient features of Hepaticopsida, Anthocerotopsida and Bryopsida, 4.2. System of classification up to Class (Proskauer 1957), 4.3. Amphibian nature of bryophytes, 4.4 Economic and ecological importance.	6	Students are acquainted with bryophyte features, diversity, their nature, classification, economic and ecological importance.	Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vol. I)

Name of the faculty: Dr. Sukanya Chakraborty
DSC/ Core paper COURSES (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	DSC/Core	Plant diversity (theory)	Gymnosperm	6	Introductory idea on gymnosperms	Ganguli,H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. II, New Central Book Agency
III	SEC	PLANT TISSUE CULTURE AND HORTICULTURE PRACTICES (THEORY) Practical	A. Plant Tissue Culture- 1. Plant Tissue Culture 4. Production of useful metabolites by tissue culture techniques 2. Media preparation, sterilization and aseptic inoculation of explant for seed culture	3+6	Students will gain knowledge on the basics of plant tissue culture, its applications. In addition they will also get to know the techniques of production of important plant derived secondary metabolites	Jha TB, Ghosh B. Plant Tissue Culture, 2003; University Press Dey KK. Plant Tissue Culture, 1992; New central Book Agency

IDC (Botany):

SEM	Course	Topic	Sub-Topic	No. of Lecture Hours	Learning Outcome	Reference books
I	PLANTS AROUND US (THEORY)	3. Plants and society		10	Brief general information on plants of day to day life	Studies in Botany {vol-l)- J.N,Mitra, Dehahrata Mitra & Salil Chowdhury (Moulik Library) ECONOMIC BOTANY, Singh, Pandey and Jain, Rastogi Publications,
II	PLANTS AROUND US (THEORY) PLANTS AROUND US (PRACTICAL)	3. Plants and society 4. Plants and human health Identification, microscopic, macroscopic study, work out of flower		5 30	Introductory idea on medicinally important plants Basic idea on the morphology of commonly observed algae, fungi etc. and structure, organization of different floral parts	

Scottish Church College

Department of Computer Science

Program Specific Outcome & Course Specific Outcome

Program specific Outcomes (PSO):

After successful completion of B.Sc. in Computer Science, students gain the knowledge of the following:

1. An essential skill of problem solving with different dimensions of computer science and computing.
2. Ability to understand the principles and working of computer systems to assess both the hardware and software aspects.
3. Professional skills of software design including familiarity and practical competence with a broad range of programming language and open source platforms.
4. Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm.
5. Ability to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.
6. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
7. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (CO):

1. Study of Computer Fundamentals, and Digital Circuits enables the students to describe the usage of computers, why computers are essential components in business and society and identify categories of programs, system software and applications.

2. Data visualization helps the students in better understanding of data by presenting it in a pictorial or graphical format. It also gives the knowledge of charts, graphs, and maps.

3. Study of C language can be used for low-level programming, such as scripting for drivers and kernels and it also supports functions of high level programming languages, such as scripting for software applications etc.

4. With HTML, CSS students will be able to create web pages using HTML elements (headings, paragraphs, images, links, etc.), design and build visually appealing and user friendly web pages, style and layout web pages using CSS, create responsive and accessible web designs.

5. Data Structure and Algorithm helps to understand the basics of data structures (arrays, linked lists, stacks, queues, trees, graphs), learn how to analyze and compare the time and space complexity of different algorithms, understand the trade-offs between alternative solutions to computing problems.

6. Study of Computer Architecture and Organization, helps to learn about the design of computers which includes both overall design, or architecture, and their internal details, or organization.

7. Mobile app development helps to design and build visually appealing and user friendly mobile apps, understand how to create apps that are responsive, adaptive and accessible and build a portfolio of mobile apps showcasing Flutter and Dart skills.

SCOTTISH CHURCH COLLEGE

DEPARTMENT OF ECONOMICS

COURSE OUTCOME

CCF

Microeconomics (I) [For Semester-I]

After completion of Microeconomics 1, a student can

- Understand the difference between traditional and modern Definitions of economics.
- Distinguish between positive and normative branches of economics.
- Perform supply and demand analysis to understand the impact of economic events on Markets.
- Examine the behavior of consumers in terms of the demand for products.
- Understand market failure and the role of the government in dealing with those failures.
- Discuss about the production combination by a producer with full employment situation.

Skill Enhancement Course (ECON-H-SEC1-1-Th)

Introductory Statistics and Applications (I)

CO: This course provides the basic theoretical concepts viz., collection and presentation of data, descriptive statistics etc. that are needed for univariate and bivariate data analysis.

Course: MECO (Minor 1): Microeconomics (I)

After completion of this course a student can gather basic theoretical knowledge as follows-

- The difference between traditional and modern definitions of economics.
- Distinction between positive and normative branches of economics.
- Concepts related to supply and demand analysis
- Theory related to consumer's choice
- Market mechanism, market efficiency and market failures
- Evolution of market economy, market adjustments

- Market sensitivity and elasticity

Course: ECOD: Interdisciplinary Course (IDC)

After completion of this course a student can gather elementary idea on the following-

- Subject matter of economics
- Theories of demand, supply and market
- Concepts related to definition and measurements of national income, money and inflation
- Economic growth and development, poverty and inequality: definitions and measurements
- Economic planning in India under the planning Commission
- NITI Aayog

CCF Course Outcome: Semester Two

Course: CC2: Macroeconomics (I)

After completion of this course a student can develop theoretical knowledge regarding introductory topics related to macroeconomics. S/he can learn-

- Definition and derivation of a nation's income, methods of measurement of national income, related problems.
- The role of the government in the economy.
- Concepts related to savings and investment, difference between corporate savings, public savings, personal savings, taxes and disposable income. Government budget.
- Major macroeconomic theoretical models: classical and Keynesian models, introduction to the Keynes-Classics debate, multipliers.
- Theory of Investment demand.
- Concepts related to inflation, anti-inflationary policies.

Skill Enhancement Course (ECON-H-SEC2-2-Th)

Introductory Statistics and Applications (II)

CO: This course provides the practical methods of data analysis using a statistical

software.

Microeconomics (II) [For Semester-III]

After completion of Microeconomics III, a student can

- Derive the demand curve from the analysis of consumer behavior discussion.
- Explain the derivation of the indifference curve from the information about the consumption choice.
- Understand different types of production functions with different factors that can affect the production behavior.
- Discuss the concept of cost associated with production process.
- Understand the behavior of a perfectly competitive firm and industry.
- Explain the impact of government intervention in perfectly competitive market structure.
- Discuss the behavior of input market under perfect competitive and also the derivation of labour supply curve.

Semester III

Economics

Development Economics I

DSCC4

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

demonstrate the understanding of the difference between growth and development, major growth theories, the measurement of inequality, significance of dual economies in developing countries, poverty and population issues facing the world, international trade. and importance of foreign aid. They will also develop understanding on financial inclusion.

Upon completion of this course, students should be able to: Identify the main players and instruments needed for financial market development. Measure the degree of financial development and inclusion for a country or countries using a wide range of standard indicators.

ENGLISH

Programme Specific Outcomes

- The Department of English sees itself as a centre for intellectual and creative thinking which will help students to become sensitive human beings possessing aesthetic awareness. Partaking of the legacy of a 189-year old department it attempts to redefine the parameters of knowledge dissemination within the rich cultural heritage of the College. In the process students will imbibe more humane qualities which will equip them to deal with the challenges of a fast-paced world of mechanical existence.
- Analytical skills in linguistic communication and literary criticism enable them to analyse oral and written discourse of various genres, social, cultural, political and historical contexts and use them in advanced studies in a wide range of corporate, communication, research and knowledge fields.
- Students who have graduated from the department of English have used their newly acquired knowledge practices and aesthetic expressions to engage in research work and higher studies. Others have used their writing and reading skills to take up professions like teaching, journalism, copywriting, editing, publishing, advertising and marketing as well as analogous disciplines like theatre and film studies. Knowledge of English and precise communication skills stand them in good stead in professions like banking, public administration and human resource.

Course Outcomes

Major

- **ENG-H-DSC-1-1**
  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE ABOUT ENGLISH POETRY
  INTRODUCTION TO ENGLISH LITERATURE (POETRY)
  Canonical English poetry gives the students a solid grounding in British poetry that helps them to be grounded research scholars and teachers. A strong base in reading such poets as prescribed in the syllabus will give the student confidence in handling them at a later and higher stage of academic engagement as well as equip them with knowledge to handle a class as teachers.

- **ENG-H-DSC-2-2**
  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE ABOUT ENGLISH PROSE
  INTRODUCTION TO ENGLISH LITERATURE (PROSE)

Students will be able to understand the changing ethos of the different periods of English literature through an exhaustive exploration of the history of English prose writing, that includes both fiction and non-fiction. The specific texts prescribed in the syllabus over and above the history of prose writing in English, would be helpful in offering the student a glimpse of the diversity of genres, ranging from short stories to periodical essays.

- **ENG-H-DSC-3-3**
  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE ABOUT ENGLISH DRAMA
  INTRODUCTION TO ENGLISH LITERATURE (DRAMA)
  This is an exhaustive paper that offers the student a holistic view of English drama starting from the works by the University Wits, who brought structure and poetic power to their plays, right up to the Modernist and Postmodernist experiments in the twentieth century. The three specific plays prescribed in the syllabus, by Shakespeare, Bernard Shaw and J. M. Synge, are also highly representative texts that help the students in grasping different theatrical traditions in three different periods of English history.

- **ENG-H-DSC-4-3**
  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE ABOUT AMERICAN LITERATURE
  AMERICAN LITERATURE-I
  Analysing and understanding the principal thinkers and writers of American literature and their contribution to Western literature. The students will learn about American poetry, fiction and drama from different eras, and familiarise themselves with the multifaceted and layered styles of diverse authors.

- **ENG-SEC-1-1 TH**
  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE ABOUT PRACTICAL USE OF ENGLISH LANGUAGE
  BUSINESS WRITING
  Using English as an effective means of communication in the workplace especially in a non-academic environment. Ideas regarding the usage of a particular format in formal

correspondence, meetings etc. Knowledge of the proper use of English and writing etiquette in varied situations.

- **ENG-SEC-2-2 TH**
  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE ABOUT ACADEMIC WRITING IN ENGLISH
  ACADEMIC WRITING IN ENGLISH
  The aim of this course is to develop writing skills for academic purposes. To learn to write coherently according to a given pattern, to summarize ideas, to conclude purposefully.

- **ENG-SEC-3-3 TH**
  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE ABOUT TEACHING ENGLISH LANGUAGE
  ENGLISH LANGUAGE TEACHING (ELT)
  The aim of this course is to train the students to master the practical techniques and methods of teaching the English language, primary to those for whom English is a second and/or a foreign language. The syllabus covers the different approaches and methods adopted in ELT, such as the Grammar-Translation Method, Notional-Functional Approach and more. Moreover, a separate component in the course focuses on the teaching of English in the Indian context, thereby enabling students with practical guidelines to deliver themselves as efficient English teachers in the future.

Minor

- **ENG-MIN-1-1/3 TH TU**
  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE ABOUT ENGLISH POETRY
  INTRODUCTION TO ENGLISH LITERATURE (POETRY)
  Canonical English poetry gives the students a solid grounding in British poetry that helps them to be grounded research scholars and teachers. A strong base in reading such poets as prescribed in the syllabus will give the student confidence in handling them at a later and higher stage of academic engagement as well as equip them with knowledge to handle a class as teachers.

- **ENG-MIN-2-2/4 TH TU**
  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE

ABOUT ENGLISH PROSE

INTRODUCTION TO ENGLISH LITERATURE (PROSE)

Students will be able to understand the changing ethos of the different periods of English literature through an exhaustive exploration of the history of English prose writing, that includes both fiction and non-fiction. The specific texts prescribed in the syllabus over and above the history of prose writing in English, would be helpful in offering the student a glimpse of the diversity of genres, ranging from short stories to periodical essays.

IDC

- **ENG-IDC-1-1/2/3**

  COURSE OBJECTIVE: TO IMPART PRIMARY KNOWLEDGE ABOUT ENGLISH LITERATURE NOT ATUDYING ENGLISH LITERATURE

  This course is specially designed for those students who are majoring in science subjects, but intend to familiarise themselves with English literature from an interdisciplinary perspective. The texts prescribed in this course are canonical and representative, but not lengthy and complicated. Reading these texts would enable the students to develop a keen interest in English literature and explore more of it later on their own.

AEC

- **ENG-AEC/-1-1 TH**

  COURSE OBJECTIVE: TO BUILD ABILITY IN ENGLISH LANGUAGE (SEM-1)

  COMPULSORY ENGLISH

  This is a compulsory course offered to all students of all disciplines across commerce, sciences and social sciences and humanities. In this course, the students study short but interesting poems, stories and essays, which enable to improve their command of English in an effective way.

- **ENG-AEC/-2-2 TH**

  COURSE OBJECTIVE: TO BUILD ABILITY IN ENGLISH LANGUAGE (SEM-2)

  COMPULSORY ENGLISH

This is a compulsory course offered to all students of all disciplines across commerce, sciences and social sciences and humanities. In this course, the students study short but interesting poems, stories and essays, which enable to improve their command of English in an effective way.

- **ENG-AEC/-3-3 TH**
  COURSE OBJECTIVE: TO BUILD ABILITY IN ENGLISH LANGUAGE (SEM-3)
  COMPULSORY ENGLISH
  This is a compulsory course offered to all students of all disciplines across commerce, sciences and social sciences and humanities. In this course, the students study short but interesting poems, stories and essays, which enable to improve their command of English in an effective way.

Dept. of Hindi

Course Outcomes

Semester I

CC1 – The Students will develop an understanding about the ancient and mediaeval hindi poetry and the gradual progress of language and literature with changes occurred in flow of time.

IDC1 – Students learn the basics of hindi language used in government sectors for official communications.

SEC1 – The paper help the students to know about the folk tradition of hindi literature apart from formal literature available.

Semester II

CC2 – Students will get to know about various characteristics of modern hindi poetry specially from 1850 to 1940 (upto Chhayavad).

Semester III

CC3 – The paper provides a brief knowledge to the contemporary hindi poetry specially after 1940 (Chhayavadottar hindi poetry).

AEC1 – The course deals with the brief knowledge about hindi grammar and modern poetry. Students learn some of grammatical aspects of hindi language.

Department of History

CCF

Programme Specific Outcome Outcome

After completing History Honours Undergraduate Course

1. Students shall be able to demonstrate thinking skills by analyzing, synthesizing, and evaluating historical information from multiple sources.

2. Students will develop the ability to distinguish between fact and fiction while understanding that there is no one historical truth.

3. Students will produce well researched written work that engages with both primary sources and the secondary literature.

4. Students will develop an informed familiarity with multiple cultures.

5. Students will employ a full range of techniques and methods used to gain historical knowledge.

6. Students will develop an ability to convey verbally their historical knowledge.

7. Students will demonstrate their understanding of cause and effect along with their knowledge of the general chronology of human experience.

Course Outcome

Semester 1

DSCC 1- History of India From the earliest times to C 300 BCE

After completing this course the students will be able to-

1. Have a thorough understanding on the sources of history includes the literary sources and archaeological sources historical reconstruct on and interpretations with the special emphasis on gender, environment, technology and regions.
2. Understanding of the Stone age and its features, extent, different tools. Knowledge about the art and culture of Upper Paleolithic and Mesolithic age.
3. Idea on the origins, patterns of the Harappan Civilization. Knowledge on social, political, economic, religious life of the Harappan civilization.

4. Comprehend and understand the Political, social, economic, religious of the Vedic period. Students are introduced to the advent of the Aryans and the theories around the Aryan problem. Understanding of the socio religious movement in the 6th century BCE.

Skill Enhancement Course 1 Museum and Archives

1. This course introduces students to the institutions that house and maintain documentary, visual and material remains of the past. Museums and archives are among the most important such repositories and this course explains their significance and how they work. Students will be encouraged to undertake collection, documentation and exhibition of such materials in their localities and colleges. Visit to National Archives and National Museum are an integral part of the course.
2. Understanding the traditions of preservation in India Collection policies, ethics and procedures Collection: field exploration, excavation, purchase, gift and bequests, loans and deposits, exchanges, treasure trove confiscation and others. Documentation: accessioning, indexing, cataloguing, digital documentation and de-accessioning Preservation: curatorial care, preventive conservation, chemical preservation and restoration.

Interdisciplinary Course (IDC) - For Students who do not have History as Major or Minor
-IDC Making of Contemporary India (1919 -1964)

1. This course focuses on the major national movements that led on to India's independence in 1947 .It also discusses the impact of Partition on society and culture and finally the evolution of Parliamentary democracy and Indian foreign policy during its early days.

Semester 2

DSCC 2 -: Social Formations and Cultural patterns of the Ancient World Other than India

1. The students will know about the different evolution theories and the different human species that existed on earth and the final evolution of homo sapien sapiens.
2. The students will know the details of the Paleolithic culture.
3. The students will get to understand this age in transition and the Mesolithic age.
4. Students will learn about the debates on Neolithic Revolution and the cultural patterns and practices of Neolithic Age.
5. The geography of the Fertile Crescent will be learned.
6. Beginning of agriculture -The students will learn about the domestication if plants and transition to agriculture and animal husbandry.
7. The debates around the concept of Neolithic Revolution, various debates and theories why this transition to sedentary culture took place will be taught.
8. The students will learn about the setting of the Old Kingdom of Egypt, its geographical setting, its society, culture, state structure, burial custom etc.

9. Slave Society in Ancient Greece and Rome will be discussed and the students will study about agrarian economy, urbanization and trade.
10. The culture and sports and society of ancient Athens and Sparta will be taught.

Skill Enhancement Course-II - Understanding Cultural Heritage and Tourism

1. This course will enable students to explore the various aspects of cultural heritage and cultural diversity in historical perspective that discusses numerous cultural practices that have evolved over centuries. It will also address the questions of legalities and institutional frameworks for heritage, and finally deal with the issue of heritage tourism.
2. The students will learn about evolution of Heritage Legislation and the Institutional framework: Conventions and Acts— national Heritage-related government departments, Museums, regulatory bodies etc. Conservation Initiatives.
3. The students will know about the significance, concepts, and historical background of fairs, festivals, rituals and their importance in Human life and their general Introduction of social, cultural and religious culture of India.

Semester III

DSCC-III- History of India C 300 BCE to C 750 CE

1. Students get an idea of the nature of the agrarian economy and production relations up to the Mauryan period.
2. Students will become acquainted with the process of urbanization in Northern and Central India apart from the growth if trade and the coinage system which evolved in this period.
3. Students develop an understanding regarding the evolution of Indian Society from 300 BCE to 300 CE The different social stratifications and the position of Women along with property relations is also taught here.
4. Students develop a clear Idea about the formation, administrative policies of Chandragupta Maurya and Ashoka, Policy of Dhamma and the Causes for decline of the Mauryan Empire,
5. Students are familiarized with the rule of the Sungas, Kushanas and Satavahanas along with their Political and Cultural achievements.
6. The Students are able to comprehend the changes in the social systems in the Post-Mauryan period as they will study Verna, Proliferation of Jatis, changing norms of marriage and property.
7. The students are told about the rise and decline of the Gupta Empire and it's important rulers. Besides the Cultural efflorescence of the Gupta period is comprehended by them. The also learn about the Significance of the Pallava, Chalukya and the Vardhana dynasties in the Post-Gupta period.

DSCC IV- Social Formations and Cultural Patterns of the Medieval World other than India

1. Students learn about the possible causes behind the fall of Roman Empire and of the long historiography pertaining to the topic
2. Students are introduced to the society of Medieval Europe as distinct from earlier times.
3. Students develop an idea about the formation of the institution of the Christian Church, its evolution as source of considerable power, the rise of the monasteries as a movement against the institution of the church-- -this allows students to develop an idea about the evolution of Christianity as an organised religion in Europe and the reactions that set in thus. Students also learn about the heretical movements
4. Students become well versed in the first renaissance of Europe— revival of classical learning— and its implications for European culture for years to come.
5. Students learn about the second renaissance in Europe and its profound impact on European culture, growth of knowledge and beginning of university education.
6. Students develop clarity on the position of women belonging to various social categories in Medieval European society.
7. In the subtopic Witchcraft and Magic allows the students to understand the cultural nuances and contradictions of the medieval European society. The interesting interplay between science, religion and magic highlights the complex cultural beliefs of the time.

Skill Enhancement Course –III - Understanding Popular Culture of Bengal

1. In this course the students will get an opportunity to the students to explore the various facets of popular culture within their region in different genres such as the performing arts, audio-visual entertainments that would provide them with a better understanding of the cultural diversity of Bengal.
2. The students will study Jatra as a popular medium of performing art as well as dance that is Folk dances of Bengal-Gambhira, Santhali ,Chhau. (ii) Music – Folk songs of Bengal –Baul, Bhawaia.

Department of Mathematics

Course Outcomes (CO)

Semester 1 :

COURSE : MATH-H-CC1-1-Th(For MAJOR OR MINOR)

COURSE NAME : Calculus, Geometry and Vector Analysis

Upon completion of the calculus course, students will be able to understand the concept of differentiability of a function. They will be able to compute higher order derivatives of a function, limits of indeterminate forms, integrations by reduction formula, arc lengths of parametric curves, area and volume of surface of revolution.

This course will enable the students to Learn concepts in two and three dimensional geometry. They learn how to transform general equation of 2^{nd} degree curve in two and three dimensional to its canonical form. To acquire knowledge of polar of point, pair of Tangents, equation of chord with respect to parabola and ellipse.

This course helps about three-dimensional shapes like spheres, cones, and cylinders is important because they are fundamental geometric concepts that help us understand and describe the world around us, allowing us to visualize and calculate the volume and surface area of real-life objects.

Course: MATH-H-SEC1-1-Th (For Major only)

Course Name: C Language with Mathematical Applications

Students develop in depth knowledge of programming in C along with the use of several C libraries. Focus is on solving mathematical problems. There are regular class room assignments with marks that are carried over to the University Semester end exam.

Course Outcomes (CO)

Semester 2 :

COURSE : MATH-H-CC2-2-Th(For MAJOR OR MINOR)

COURSE NAME : Basic Algebra

COURSE OUTCOME : The course is divided in three groups, A, B and C.

Upon completion of group A, the student will be able to represent a complex number in polar form. They will be able to find out the roots of complex number and understand some functions of complex variables. They will also be able to solve the roots of algebraic equations by relationship between roots and coefficients, Cardan's method, Ferrari's method and will understand inequalities involving AM>=GM>=HM

Students are also introduced to Abstract Algebra focusing on the properties of integers and basic number theory, and Linear Algebra where they learn solutions of systems of linear equations and elementary properties of vector spaces.

Course Outcomes (CO)

Semester 3 :

COURSE : MATH-H-CC 3-3-TH

COURSE STRUCTURE: The course is divided in three groups, A, B and C.

Group A prepares the students with the ground work of the Rela number system and its properties, followed by in depth coverage of the topological properties of the real line together with understanding the concepts of limit points.

After completion of Groups B and C. students understand about the convergence of real sequence and series. Relation between the limit point of a set and the limit of a convergent sequence of distinct elements. Different test for convergence of series of real numbers.

COURSE: MATH-H-CC 3-3-TH

COURSE STRUCTURE: The course is divided in three groups A and B

Student learn different aspects and techniques of solutions of first and higher order ODEs in Group A with more emphasis on acquiring problem solving skills. After completion of Group B students acquire idea of groups, properties of subgroups and cyclic groups and are able to solve problems independently.

COURSE : MATH-H-SEC3-3-Th

COURSE NAME : Linear Programming and Rectangular Games

COURSE OUTCOME : Upon completion of this course the students will be able to construct a linear programming problem from a real life situation and will be able to solve the LPP by graphical method, simplex methods, transportation problem method, assignment problem method etc. They will also be able to solve game problems with or without saddle point.

IDC for Semester 1, 2 and 3

COURSE : MATH-H-IDC-1-Th

COURSE NAME : Mathematics in Daily Life

COURSE OUTCOME : The course is divided in five groups, A, B, C, D and E.

Upon completion of Group A, the students will be able to understand the definition of set, union, intersection, complementation of sets and Venn diagrammatic representation of sets.

Upon completion of Group B, the students will be able to understand concepts of integers, prime integers, congruence of integers. They will be able to convert positive decimal integers to binary and vice-versa. They will be able to apply congruence of integers in

divisibility tests, check digits of ISBN, UPC, VISA and MASTER cards, formation of Round Robin Tournament table.

After completion of "**Mathematical Logic"** student will understand the Mathematical logic, relations and functions

From the topic **Basics of Operations Research** student will learn how to form daily life optimization problem and how to solve it graphically.

From the topic **"Financial Mathematics"** student will learn how to manage fund , how to calculate interest , Ordinary Simple Annuities , dividend and income tax.

Course Outcome of Microbiology under Curriculum and Credit Framework:

[For Interdisciplinary Course (MCB-IDC) Semester 1,2 and 3] –

Introduction and Scope of Microbiology

The purpose of this Interdisciplinary course offered by University of Calcutta is to provide a brief concept of basic History and development of Microbiology. Through this course students will be able to learn the contributions of several scientists for the development of various field of this subject like in the field of soil microbiology, medical microbiology and Immunology. Students will get idea about the diversity of microbial world, Microscopy, different methods of sterilization. They also are able to know about the role of microbes in human health and environment which are very essential nowadays. They will learn about the Industrial applications of microbes and their role in food and dairy industry. At the end of this course they will cover different aspects of Microbiology.

[For both Honours (Major & Minor) and multidisciplinary]

Semester 1

In Semester 1 there is a Core course paper CC101 (For both Major and Minor – Sem 1 and 3) and a Skill Enhancement Course (SEC) paper SEC101(Only for Major).

In the theoretical part of CC101 Core course paper, entitled as Introduction to Microbiology and Microbial Diversity, the students will be given a detailed account of the chronological advancements and the history of development of microbiology wherein contributions by renowned scientists in the field of microbiology will be discussed. Students will be provided with an interesting discussion related to the diversity of microbial world. Emphasis will also be laid on different classification systems and taxonomic systems. Different characteristic features of bacteria, fungi, algae and protozoa with examples, along with their structural features and economic importance shall be elaborately discussed. Also, students will be made acquainted with an overview of the scope of microbiology with respect to application of microbes and microbial products in everyday life, research along with industrial applications.

In the SEC101 theory paper, entitled as Food Fermentation techniques and Packaging, students will be introduced to the concept of fermentation and the role of microorganisms in fermentation process. A plethora of industrially important fermented products will be discussed with relevant examples and the underlying microbiological processes. Probiotics and their importance in pharmaceutical industry and health benefits will also be discussed. As an integral part of food fermentation technique, students will also learn the various measures adopted for controlling the microbiological quality of various food products, food quality assessment protocols and standards as well as they will be learning the different aspects of food packaging techniques.

Semester 2

Semester 2 consists of a Core course paper CC102 (For both Major and Minor – Sem 2 and 4) and a Skill Enhancement Course (SEC) Paper SEC102 (Only for major)

In the theory core course CC102 paper of Bacteriology, students will learn the various aspects of cell organization in different microorganisms and the different bacteriological techniques for the cultivation,

isolation, enumeration, maintenance and preservation of microbes. Students will be skilled with various techniques of staining for the qualitative and quantitative analysis of diverse microbiological specimens. Students will learn the different kinds of microscopic techniques to visualize microorganisms and will be provided with a detailed account of the associated instrumentation techniques and principles of different kinds of microscopes. Simultaneously, in the same paper, students will also learn about the growth and nutrition requirements of microbes, the various methods of reproduction observed in bacteria and a number of important archaeal and eubacterial groups with examples, features and ecological and economic significance will also be discussed with profuse importance.

In the practical paper, students will learn to prepare different kinds of media, staining techniques and will also learn about the methods to isolate, followed by qualitative and quantitative analysis, maintenance and preservation of microorganisms.

In the SEC102 theory paper, students will be introduced to the concept of Artificial Intelligence (AI). They will learn the fundamental concepts and subfields of AI, identify real- world applications of AI across various industries, analyze the ethical, social, and economic implications of AI and also recognize the potential of AI to drive innovation and transformation in different domains.

Semester 3

Semester 3 consists of two core papers- CC201 and CC202, along with a SEC paper- SEC201

The core theory paper CC201, Biomolecules and Bioenergetics, will enable students to understand the fundamental concepts of biochemistry. The paper covers study of the structure and function of biomolecules (carbohydrates, lipids, amino acids, proteins, vitamins) and details of physical and chemical basis of biomolecules involved in life processes such as enzymes and nucleic acids. The practical paper entails the hands-on learning methodologies for buffer preparations along with qualitative and quantitative procedures for understanding the biochemical properties of different biomolecules. Numerical problems will also be discussed along with study of various models of proteins and DNA that are fundamental to the understanding of the biochemical processes in living organisms. The core theory paper CC202, entitled as Microbial Physiology and Metabolism, will facilitate the students to learn the various aspects of microbial growth and the environmental parameters that exert effect on microbial growth. The paper will also help students understand the physiological processes of microbes such as nutrient uptake and transport systems involved, respiration processes and an overview of specific metabolic systems associated with microbial processes.

The practical paper consists an elaborate understanding of microbial growth by various standardised techniques. Concepts and related techniques pertaining to the measurement of generation growth, specific growth rate and the various parameters such as temperature, nutrients and salts that exhibit an effect on microbial growth and physiology, will also be taught.

The Skill Enhancement Course, SEC201, contains a theory paper – Biofertilizers and Biopesticides. The paper will introduce students to the basics of biofertilizers and biopesticides, concepts of microbial inoculants and the numerous applications associated with these microbial products. The paper will also

enable students to learn the role of various microorganisms as nitrogen fixers, phosphate solubilizers and their potential prospect in being used in agricultural fields over chemical fertilizers.

Scottish Church College
Department of Philosophy
CCF Syllabus
Learning Objectives and Course Outcomes
Semester 1

Major and Minor Course
Semester 1
DSCC-1: Fundamentals of Philosophy

Learning Objectives
The primary objective of this course is to **introduce** the main philosophical issues to students It will encourage the students to **think critically** about some of the important questions that philosophers deal with

Learning Outcomes
1. By studying this course, a student should be able to **demonstrate** a clear understanding of the background the philosophical issues.
2. They will **understand** the key concepts of Western philosophy- epistemological, metaphysical, and ethical issues.

Skill Enhancement Course (SEC)
Semester 1
Man and Nature

Learning Objectives
The course aims to develop an ethical perspective and theoretical understanding of ethics and its practical application in daily life, it generates ethical awareness/sensitivity necessary for overall wellbeing.

Learning Outcomes
1. Knowledge of the environment and the role of human beings in shaping the environment
2. Understand various components of the environment and interfaces
3. Critically appreciate the environmental concerns of today

Interdisciplinary Course (IDC)
Semester 1
Philosophy of Peace and Conflict Resolution
The course aims to provide students with an introduction to the complex social and cultural dimensions of conflict and peace. The course reviews a range of theories exploring the nature of peace and theories of peacebuilding.

Learning Outcomes
1. Recognize foundational concepts in peace and conflict studies.
2. Value the interdisciplinary nature of peace and conflict studies.
3. Demonstrate awareness of conflict resolution.

Semester 2

Major and Minor Course
Semester 2
DSCC-2: Outlines of Indian Philosophy

Learning Objective
The course aims to help students to gain knowledge of Indian Philosophy and to learn the types of Indian Philosophical systems and to understand the aims and values of the systems.

Learning Outcomes
1. By studying this course students will understand the richness of Indian Intellectual Traditions
2. They will appreciate the concepts of Ṛta, Ṛṇa, The reality of the world, The Law of Karma and The reality of Self which will help them to understand and appreciate different perspectives within the society at large.
3. They will learn to develop scientific, logical and rational inquiry for understanding the systems.

Skill Enhancement Course (SEC)
Semester 2
Recent Issues in Philosophy: Political and Ethical

Learning Objectives

The course aims to help students to understand the historical growth of the idea of human rights and feminism. Students will be able to demonstrate an awareness of the various aspects of human rights and the key concepts of feminism.

Learning Outcomes

1. By studying this course students will be able to identify issues and problems relating to the realisation of human rights, and strengthens the ability to contribute to the resolution of human rights issues and problems. It also develops investigative and analytical skills.
2. Articulate and understand the history of feminism and feminist theories and methodologies and their applications to a number of different academic fields.
3. Understand the difference between “sex” and “gender” and be able to explain social construction theories of identity.

Interdisciplinary Course (IDC)
Semester 2
Philosophy of Peace and Conflict Resolution

The course aims to provide students with an introduction to the complex social and cultural dimensions of conflict and peace. The course reviews a range of theories exploring the nature of peace and theories of peacebuilding.

Learning Outcomes

4. Recognize foundational concepts in peace and conflict studies.
5. Value the interdisciplinary nature of peace and conflict studies.
6. Demonstrate awareness of conflict resolution.

Semester 3

Major and Minor Course
Semester 3
DSCC-3: Indian Philosophy-I

Learning Objective
The course aims to help students to gain knowledge of Indian Philosophy and to learn the types of Indian Philosophical systems and to understand the aims and values of the systems.

Learning Outcomes

1. By studying this course students will understand Demonstrate a comprehensive understanding of the core concepts, doctrines, and classifications of Indian philosophical systems, including both **Āstika (orthodox)** and **Nāstika (heterodox)** schools.
2. Critically analyze and compare the metaphysical, epistemological, and ethical principles of various Indian philosophical schools, such as **Cārvāka**, **Jainism**, **Buddhism**, **Nyāya**, **Vaiśeṣika**, **Sāṃkhya**, **Yoga**, **Mīmāṃsā**, and **Vedānta**.
3. Apply philosophical insights from Indian traditions to contemporary issues, including ethics, interfaith dialogue, environmental sustainability, and personal well-being, fostering holistic and practical approaches to life.

DSCC-4: Western Logic-I

Learning Objective
The course aims to help students to equip students with the ability to understand and apply the principles of reasoning, focusing on the structure of arguments, the distinction between valid and invalid reasoning, and the use of formal tools to evaluate logical consistency and soundness.

Learning Outcomes

1. Demonstrate a clear understanding of the fundamental concepts of Western logic, including **propositions**, **arguments**, **deductive and inductive reasoning**, and the principles of **truth and validity**.

2. Apply formal logical techniques such as **symbolization**, **truth tables**, **Venn diagrams**, and **formal proofs** to analyze and evaluate arguments for consistency, soundness, and validity.
3. Develop critical thinking and problem-solving skills by employing logical reasoning to construct and critique arguments, resolve contradictions, and analyze complex philosophical and real-world issues.

Skill Enhancement Course (SEC)
Semester 3: Logical Reasoning and Applications

Learning Objectives

The course aims to help students to **enhance analytical and problem-solving skills** and develop the ability to analyze complex arguments, identify logical fallacies, and apply principles of reasoning to solve problems in academic, professional, and real-world contexts effectively.

Learning Outcomes

1. By studying this course students will be able to demonstrate proficiency in applying logical tools such as **reasoning**, and **symbolic representation** to analyze and construct valid arguments.
2. Develop the ability to critically assess the soundness and validity of arguments by identifying logical fallacies, inconsistencies, and ambiguities in various contexts, including academic, professional, and everyday reasoning.
3. Apply logical reasoning skills to real-world problems, fostering effective decision-making and problem-solving in diverse fields such as ethics, law, science, and technology.

Interdisciplinary Course (IDC)
Semester 3
Philosophy of Peace and Conflict Resolution

The course aims to provide students with an introduction to the complex social and cultural dimensions of conflict and peace. The course reviews a range of theories exploring the nature of peace and theories of peacebuilding.

Learning Outcomes

7. Recognize foundational concepts in peace and conflict studies.
8. Value the interdisciplinary nature of peace and conflict studies.
9. Demonstrate awareness of conflict resolution.

Scottish Church College
Department of Political Science

Course Outcomes of Semester-I, II and III (Under CCF, 2022)

Semester-1

1. **Political Theory: Foundational Concepts (CC and M1**)

The paper introduces the basic concepts of politics and prepares the students to explore the meaning of 'political' through the theories of state, sovereignty and citizenship. Through this paper, the students shall have the following outcomes:

a) They learn about the meaning of rights, liberty and justice in political theory and understand that these values are important in politics.

b) This course also enables them to learn the importance of democracy in protecting individual rights and authoritarian regimes in negating the foundation of individual rights in political theory.

c) Most importantly, it helps them to relate these theories to political practices.

2. **Democratic Awareness through Legal Literacy (SEC-1)**

Students should have the following outcomes through this paper.

1. It enables students to understand the dynamics of legal structures in India. It imparts legal skills to students by introducing personal laws, labour laws, environmental laws and consumer laws in India.

2.The course also helps to understand the recent issues like terrorism, cybercrime and the right to information from legal perspectives.

3. This course also enables students to conceptualise the legal aspects of politics in India.

3. **Understanding Governance (IDC):**

Students should have the following outcomes.

1. They will come to know about the meaning and features of governance in the era of globalisation and the Indian context

2. The course should also enable them to understand the relationship between democracy, development and the idea of governance as propagated by the World Bank.

3. Students should also be able to explore new trends in governance like the right to information, green-governance, E-governance and citizens' charter, especially in the Indian context.

4. **The Constitutional Values and Fundamental Duties (CVAC)**

This course is interdisciplinary. Students must be able to realise these outcomes.

1. The course introduces the philosophy and value of the Indian Constitution to all. It explains its significance that all citizens are rights-bearing citizens and must know the origin and importance of the Indian Constitution.
2. It also introduces the concept of fundamental rights and duties to all and the significance of the fundamental duties in our lives.
3. It enables the students to understand the meaning of constitutionalism, socialism, secularism and democracy in the present context.

Semester-2

1.**Constitutional Government in India (CC and M2)**

Students shall have the following outcomes.

It introduces the idea of Constitutionalism and the philosophy of our Constitution. The students shall be able to understand the nature of the Indian state by knowing the values of socialism, secularism, republicanism and popular sovereignty.

2.They should also be able to comprehend the government institutions and the way it functions.

3. The composition and functions of the government organs such as executive, judiciary, legislature and other constitutional bodies shall also explain the constitutional design of our public institutions to students.

2. Understanding the Legal System (SEC-2)

The following outcomes are expected through this paper.

1. Students shall be able to understand the nature of the Indian legal system and different procedures through which legal justice is possible for individuals.
2. They will be introduced to a new set of laws on women, children, environment, cyber crimes, labour and consumer rights which shall help them to protect their rights through our legal system.
3. Students shall also come to know about new legal developments like the right to information and anti-terrorist laws for the protection of their human rights.

3. Understanding Governance (IDC):

Students should have the following outcomes.

1. They will come to know about meaning and features of governance in the era of globalisation and in the Indian context

2. The course should also enable them to understand the relationship between democracy, development and the idea of governance as propagated by the World Bank.

3. Students should also be able to explore new trends in governance like right to information, green-governance, E-governance and citizens' charter, especially in the Indian context.

Semester-3

1. Political Theory: Approaches and Debates (CC-3)

The paper should have the following outcomes for students.

1. Students shall be able to learn contemporary political debates and theories in-depth. They shall be able to explore the link between theory and practice.
2. An understanding of liberalism, normative feminism and post-colonialism should help them to understand recent debates in contemporary politics.
3. Students will also be introduced to Marxist theories to get an in-depth understanding of class struggle, politics and society.

2. Politics in India I: Structures (CC-4)

The paper should have the following outcomes for students.

1. Students should learn the nature of Indian politics and public institutions. They shall be able to comprehend the recent trends in the national party system and political parties in the context of West Bengal.
2. They will also be introduced to the definition and functions of the pressure groups in India.
3. Students shall also understand the nature of Indian federalism through inter-governmental forums and civil service.

3. **Legislative Practices and Procedures (Sec-3)**

The paper should have the following outcomes for students.

1. Students should be able to understand different dimensions of legislative procedures.
2. They should also know the complex issues of policy making and real life legislative work.
3. The paper should also help them to understand the procedures of Parliament and different committees in Indian public institutions.

4. Political Theory: Foundational Concepts (Minor and MDC)

The paper introduces the basic concepts of politics and prepares the students to explore the meaning of 'political' through the theories of state, sovereignty and citizenship. Through this paper, the students shall have the following outcomes:

d) They should learn about the meaning of rights, liberty and justice in political theory and understand that these values are important in politics.
e) The paper enables them to learn the importance of democracy in protecting about individual rights and authoritarianism regimes in negating the foundation of individual rights.
f) Most importantly, it helps them to relate these theories to political practices and realities.

5. **Understanding Governance (IDC):**

Students should have the following outcomes.

1. They will explore the meaning and features of governance in the era of globalisation and in the Indian context

2. The course should enable them to understand the relationship between democracy, development and the idea of governance as propagated by the World Bank.

3. Students should also be able to explore new trends in governance like the right to information, green-governance, E-governance and citizens' charter, especially in the Indian context.

Course outcome of SEM 1 Zoology (Major + Minor) papers CC1, SEC 1 and IDC

CORE COURSE-1: Cell Biology Major/Minor/MDC: CC1-TH

Upon successful completion of this course, students should acquire the detailed knowledge of different components of a cell, pathways related to cellular functioning in healthy and diseased states, cell signaling and apoptosis which will enable them to understand the pathology of tumor genesis and cancer. They should also be able to develop basic understanding and handle different instruments required for cell biology studies.

Knowledge-Based Outcomes

1. **Explain the structure and function of cellular components**: Describe the characteristics, organization, and roles of biomolecules, organelles, and cellular membranes.
2. **Describe the mechanisms of cellular processes**: Explain the processes of cell signaling, transport, division, and communication, including the underlying molecular mechanisms.

Skill-Based Outcomes

1. **Analyze and interpret cellular data**: Collect, analyze, and interpret data from cellular experiments, including microscopy and biochemical assays.
2. **Design and propose cellular experiments**: Design and propose experiments to investigate cellular processes and mechanisms, including the selection of appropriate techniques and controls.
3. **Communicate cellular concepts effectively**: Communicate complex cellular concepts and data effectively through written reports, oral presentations, and visual aids.

Application-Based Outcomes

1. **Apply cellular principles to real-world problems**: Apply knowledge of cellular biology to understand and address real-world problems, such as human diseases, environmental issues, and biotechnological applications.
2. **Evaluate the impact of cellular research on society**: Evaluate the impact of cellular research on society, including the ethical, economic, and environmental implications.
3. **Develop critical thinking and problem-solving skills**: Develop critical thinking and problem-solving skills through the analysis of complex cellular problems and the design of innovative solutions.

SEC-1: Applied Entomology Major; SEC-1-TH

Upon successful completion of this course, the student will understand the prerequisite to silkworm rearing and beekeeping, be able to identify where to purchase equipment and demonstrate how to

assemble it and may set up a cottage industry. They also acquire detailed knowledge about the economic and nutritional and medicinal importance of silk and honey respectively as well as economic importance of other bee products.

They should also be able to understand the diversity of insects, role of insects as vectors, in forensic science and the concept of insects as pest and integrated pest management.

Knowledge-Based Outcomes

1. Identify and classify insect pests and beneficial insects: Recognize and classify insects of economic importance, including pests and beneficial insects, using morphological and molecular characteristics.
2. Explain the principles of insect ecology and behavior: Describe the ecological and behavioral principles that govern insect populations, including habitat, food, shelter, and social interactions.
3. Discuss the major insect pest management strategies: Explain the different approaches to managing insect pests, including cultural, biological, chemical, and integrated pest management (IPM) strategies.

Skill-Based Outcomes

1. Conduct insect surveys and monitoring programs: Design and implement insect surveys and monitoring programs to detect and quantify insect populations.
2. Develop and implement integrated pest management (IPM) plans: Design and implement IPM plans that incorporate multiple control strategies to manage insect pests in agricultural, urban, and natural ecosystems.
3. Analyze and interpret insect-related data: Collect, analyze, and interpret data related to insect ecology, behavior, and management, including statistical analysis and data visualization.

Application-Based Outcomes

1. Apply insect ecology and management principles to real-world problems: Apply knowledge of insect ecology and management to address real-world problems, such as agricultural pest management, vector-borne disease control, and conservation biology.
2. Evaluate the economic, environmental, and social impacts of insect management strategies: Assess the economic, environmental, and social implications of different insect management strategies, including the potential risks and benefits.
3. Develop effective communication skills for stakeholders: Communicate insect-related information effectively to various stakeholders, including farmers, policymakers, and the general public.

IDC-1: Animal Biology

Upon successful completion of this course students will be able to appreciate the diversity of life and develop a critical understanding how animals changed from a primitive cell to a collection of cells to a complex body plan. The project assignments will also offer them an essence of research to find the process involved in studying biodiversity and taxonomy.

They should also be able to understand the basic organization of prokaryotic and eukaryotic genome and perform genetic analysis at the gene, genome and population levels, understand gene expression and gene regulation mechanisms and be able to solve genetic problems. It also helps students to learn the molecular aspects of genetic disorders and mutations.

They will be able to engage in field-based research activities to understand the theoretical aspects taught besides learning techniques for gathering data in the field. They will also be able to analyze a biological problem, derive testable hypotheses and then design experiments and put the tests into practice. They will also develop the ability to solve the environmental problems involving interaction of humans and natural systems at local or global level. They should also be able to understand the diversity of insects, role of insects as vectors. They should also be able to develop basic understanding and handle different instruments required for cell biology studies.

Knowledge-Based Outcomes

1. **Describe the characteristics and classification of major animal groups**: Explain the characteristics, classification, and evolutionary relationships among major animal groups, including Porifera, Cnidaria, Platyhelminthes, Nematoda, Mollusca, Echinodermata, and Chordata.

2. **Explain the principles of animal body structure and function**: Describe the organization and function of animal body systems, including skeletal, muscular, nervous, circulatory, respiratory, and digestive systems.

3. **Discuss the adaptations and diversity of animals in different environments**: Explain how animals have adapted to survive in different environments, including terrestrial, freshwater, marine, and aerial ecosystems.

Skill-Based Outcomes

1. **Identify and classify animals using taxonomic keys and characteristics**: Use taxonomic keys and characteristics to identify and classify animals, including the use of morphological, anatomical, and molecular features.

2. **Analyze and interpret data on animal diversity and ecology**: Collect, analyze, and interpret data on animal diversity, ecology, and conservation, including the use of statistical software and data visualization tools.

3. **Communicate scientific information about animal diversity effectively**: Communicate scientific information about animal diversity effectively through written reports, oral presentations, and visual aids.

Application-Based Outcomes

1. **Apply knowledge of animal diversity to conservation and management**: Apply knowledge of animal diversity to address conservation and management issues, including the impact of human activities on animal populations and ecosystems.
2. **Evaluate the impact of human activities on animal diversity and ecosystems**: Assess the impact of human activities, such as habitat destruction, pollution, and climate change, on animal diversity and ecosystems.
3. **Develop critical thinking and problem-solving skills in animal diversity**: Develop critical thinking and problem-solving skills through the analysis of complex issues related to animal diversity, ecology, and conservation.

Course outcome of SEM 2 Zoology (Major + Minor) papers CC2 and SEC-2

Part I:Semester 2
CC2: Biochemistry

Upon successful completion of this course, students will able to understand the structure, types, properties and metabolism of carbohydrate, protein, lipid, enzyme and nucleic acid. Acquiring knowledge about free radicals and antioxidants, students will understand how these factors interact with each other to maintain health and prevent diseases.
Practical knowledge about the quantitative tests for carbohydrates, proteins and fats will help the students to detect the presence of these substances in food samples. After performing practical on colorimetric estimation of protein and amylase, students will easily quantify the concentration of these components in any sample.

This course will prepare the students for making clinical diagnosis, understanding pathology and treatment of diseases, designing of drugs and understanding their metabolism and manufacture of various biological products like amino acids, proteins, antibiotics, hormones, enzymes, nutrients etc.

Part I: Semester 2
SEC 2: Aquaculture

After successful completion of this course, students will acquire practical skill based knowledge about culture methods of fishes, shrimps, prawns. They will also be able to identify the quality of cultivable indigenous and exotic fishes. Students will become knowledgeable about Aquarium fisheries, fish biotechnology and fish pathology.
Students will bring out further development in the field of aquaculture by performing experimental research activities.

This skill enhancement course will be beneficial for students to widen their avenue in the field of job and entrepreneurship.

Course outcome of SEM 3 Zoology (Major + Minor) papers CC3, CC4 and SEC-3

Genetics - CC3- SEM 3:

Upon successful completion of this course students will be able to understand the basic structural organization of chromosomes including the idea of giant and satellite chromosomes and their mode of arrangements. The types of chromosome mutations, concept of alleles, chromosomal aberrations, fine structure of genes, the idea of linkage of genes and crossing over are also part of the outcome. The inheritance pattern of cytoplasmic and organelle genes and their extra-chromosomal effect, the concept of jumping genes and the quantitative aspects of polygenic inheritance are also included in this paper. The practical part of this course includes the biostatistical analysis of chi-square test, identification of *Drosophila* and Human chromosomal aberrations and the analyses of family genetic chart. All these studies will be very beneficial for the students to pursue their future higher studies.

Cells and Tissue- CC4- SEM 3:

Upon successful completion of this course the students will gather knowledge about cells and tissue structure. The course includes the concept of histochemistry of stain and dye, types of tissue systems including epithelial, connective, muscle and nervous. The concept of mechanism of tissue repair is also included. The practical aspect comprised the procedure for tissue staining, tissue preparation and their identifications.

Farming and Animal Husbandry- SEC-3- SEM 3:

Upon successful completion the students will enhance their skills on breeds of fowl, poultry farming including their nutrition, diseases and also the economical aspects in poultry marketing. The animal husbandry part includes cattle breeds, livestock feeds, breeding program, dairy farming and their pathology. The practical aspects will enrich the students with visits to a poultry farm or animal husbandry farm and also the identification of poultry and cattle breeds.

Program outcomes, program specific outcomes and course outcomes for all programs offered by the institution are stated and displayed on website and communicated to teachers and students.

Bachelor of Business Administration

Programme Specific Outcome:

1. Study of Business Administration enables the student to enter the arena of Management of organizations, industrial activities and individuals, and also crisis management.

2. Study of Finance Management enlightens the students to understand the financial requirement, availability, allocation and utilization of financial resources.

3. Study of Marketing Management enables the students to learn about marketing strategies, viability of a project, marketing techniques, market demand study, etc.

4. Human Resource Management enriches style of management of people, management of self and optimum use of human capital.

5. The curriculum also contributes towards personality development of an individual.

6. BBA Course enables students from heterogeneous background to learn and develop skills related homogeneous platform called 'Management'.

7. When students graduate from this course, acquainted and equipped with management and its various implications, industry treats them as 'Job Ready' products.

8. This is a professional course with high degree of employability. Therefore the 'Return on Investment' is quick and highly probable in comparison to its contemporaries.

9. Along with core management papers, there are other subjects taught in this course like Statistics, Operational Research, Business Communication, which enriches the Critical, Operational and Analytical abilities of the students as well as boosts their public presence and confidence.

This course therefore focuses upon the 'All Round' development of the students academically, socially, psychologically & industrially.

Course Outcomes:

1. Students improve their communication skills and they learn the integrated parts of corporate communication. They learn how to draft corporate correspondence and design CV, notice etc.
2. Principals of Management & Organizational Behaviour - The subject Principles of Management help students learn the basics of Management which helps them to have an overview on management as a whole. Organizational Behaviour on the other hand helps understand the psychological or Behavioural patterns of the working of the organization, which strengthens a student's perception about an Organization and its component human behaviour.
3. Business Accounting - This Enables the students to understand the fundamentals of accounting and also aims to highlight how accounting principles work within a business concept by means of practical problems and solutions.
4. Entrepreneurhip Development - Upon successful completion of this course the student develop and can systematically apply an entrepreneurial way of thinking that will allow them to identify & create business opportunities
5. Organisations function and flourish in the environment, therefore the students should be well versed with organisational impact on environment and how both can survive and sustain each other with mutual cooperation.
6. This subject will enable students to compare data and facts from the past and draw inference to take most appropriate decision.
7. Upon successful completion of this course students will be able to develop and understanding of the applications of managerial economics. Students can interpret regression analysis and discuss why its employed in decision making.
8. It helps the students learn to strike a balance between corporate profit earning and social welfare. They learn the basics of Corporate Social responsibility.
9. The Students will develop an understanding about the Human Resource Management systems and its relevance in organizations and learn necessary skill sets for application of various Human Resource issues and this knowledge will help in taking correct business decisions.
10. Marketing management is one of the important subjects to be understood, by a student of management. The knowledge arms students with the understanding of the mechanisms of market.
11. This subject helps the students to know about the account to be maintained by the mangers.It helps them to understand the different procedures of managing accounts and how they are created.It involves the students to take decisions after analysing the various accounts coming under it.
12. Students learn the basics of Production and Operations. The learning is supported by practical exposures of industrial tours. Students learn about the Japanese Quality endorsement systems set as a benchmark of quality standard specifications.

13. This paper helps the students to understand the growing need and different features of information technology and to optimally utilize it for the smooth running and development of the organisation.
14. Students learn the basics of research orientation in business. They get hands on training on Research methodology. They learn how to design hypothesis and how the same could be tested.
15. This paper gives them in depth knowledge about different economic variables like National Income, GDP, Unemployment rate etc.
16. Students can learn about the various tools and techniques applied to finance. It helps them to take decision about investment. It helps students to analyse and recommend about worthy of an investment whether its personal or corporate.
17. Students will get to know about different concepts regarding tax planning, computation of Income from House property, computation of income under the head of salary, profits and gain from business and profession, concept of Goods and Services Tax (GST), taxable income and tax liability of companies etc.
18. It enables them to acquire hands on experience from work floor and relate theory with real world experience.
19. Quantitative Techniques Upon successful completion of this course the students can identify the source of a quantifiable problem, recognise the issues involved and produce an appropriate action plan. Students can translate a problem into a simple mathematical model to allow easier understanding and to aid problem solving.
20. Legal Aspects of Business - Knowledge about the laws that control organizations, and its components helps students have the understanding about the legal framework within which corporations are bound to work. Companies Act 2013, Limited liability Partnership Act 2008, Consumer protection Act 1986, and Right to Information Act 2005 consolidates the legal understanding of the student.
21. Strategic Corporate Finance (***only for Finance Major***) - Students can have detailed idea of different types of costs arising in a business concern, strategies for Management Buy in and out, financial distress and corporate restructuring, process of company valuation etc.
22. Investment Analysis and Portfolio Management (***only for Finance Major***) - The outcome of the subject taught under this is the real life investment and what are the parameters the investors must consider and how portfolio is managed. The students can act as an advisor to those who are investing in financial market. This subject is all about investment in share market, mutual funds other avenues available in financial market. The students after learning this subject can act as a friend, philosopher and guide to the investors.
23. Consumer Behaviour ***(Only for Marketing Major)*** - Students are made aware of the determinants of consumer behaviour. They know about Consumer rights. They are introduced to different models of business communication.
24. Advertising and Brand Management (***Only for Marketing Major***) - The Students will be able to examine Advertising and its functions in relation to brand success. They will be able to

critically evaluate how creative concepts and executions will contribute to brand success and analyse advertising and branding techniques and apply them to a variety of different issues.

25. Business Policy and Strategy - This enables the students to understand different market polices available and what are the different strategies to be adopted to overcome different policy related challenges.

26. Financial Institutions and Markets - Students can learn the role of financial system on economic development and also various issues related to risk and return, role of regulatory bodies, significance of commercial banking etc.

27. Investment Banking and Financial Services (***only for Finance Major***) - The main focus of this field of study is to teach students how to minimise the risks associated with investments.

28. Marketing of Services ***(Only for Marketing Major)*** **-** In a dynamic economic environment where services contribute to almost two-third of the world economy, this paper helps students to understand the different associated challenges in the industry and what actions and processes are to be taken to deliver the goods to end customers.

29. Research Project - Students take up a major project based on their internship or from the project guide, upon which they conduct independent survey and research work to find out certain predefined objectives. These activities induce independent thinking and analytical ability in them.

Bengali

Programme Specific Outcome

1. Grasp the complexity of language as a communication system shaped by cognitive, biological, cultural, and social factors.
2. Demonstrate understanding of the concepts, theories, and methodologies used by linguists in qualitative and quantitative analyses of linguistic structure, and patterns of language use.
3. Demonstrate understanding of processes of language change and variation, the role of language in reflecting and constructing social identities, and the distinctive properties of human language.
4. Are able to collect, organize and analyze linguistic data from diverse languages, to form hypotheses about language structure/use and to test those hypotheses against new data.
5. Acquire the technical vocabulary and theoretical tools of the field, necessary to read published linguistic research.
6. Can synthesize research findings and construct a readable, well supported research report.
7. Are ready for significant scholarly participation in the field of linguistics.
8. Studying Bengali Literature can raise students' awareness of aspects of Bengali culture

9. It enables students to understand that culture is a broad concept that can mean different things to different people.
10. Students can understand and respond to ideas, viewpoints, themes and purposes in texts.
11. They can relate texts to the social, historical and cultural contexts in which they were written and can analyse how writers' use of linguistic and literary features shapes and influences meaning writers' use of organisation, structure, layout and presentation.
12. They also can generate ideas, planning and drafting.
13. They are able to use and adapt the conventions and forms of texts on paper and on screen.
14. Students can vary sentences and punctuation for clarity and effect.
15. Studying Literature helps the students to improve vocabulary for precision and impact.
16. It also helps the students to develop varied linguistic and literary techniques. Students learn structuring, organising and presenting texts in a variety of forms on paper and on screen.
17. The course of Literature helps them to develop and use editing and proofreading skills on paper and on screen.
18. Help them Commenting on language use and also locating and extracting information.

Course Outcome

Paper I and II

- The course provides a brief introduction to the history of Bengali language. The beginning of writing system in Bengali within the emergence of writing culture in India is addressed to start with. The followed by a discussion on the language family of the Indian sub-continent and *IndoAryan f*amily of languages to which Bengali belongs to. The subsequent three parts deal with Old Bengali, Middle Bengali & Modern Bengali phases of the language. Rather than discussing the features only, we plan to introduce some texts of the said periods (i,e :Chorjapod, Srikrisnokirton, Mongolkabya)

Paper III and IV

- The spoken language is very different in various geographical locations. Also there are dissimilarities in various social groups within a language – community. We tend to present before the students various dialects spoken in various parts of Bengal and surrounding areas. Also we will discuss different language styles in various social groups in this course.
- Cultural Behavior of the language community Here the students will get to know the behavior ofthis cultural community called *Bengali*. Both the historical and descriptive approach will be taken into account.

Paper V

- Bengali has a rich oral tradition from the olden days. Objective of this paper is to focus upon various oral traditions like Folktales, Folklore/Songs and Myths and proverbs of Bengali and to make the students familiar to that abundance of beliefs and practices which had been a source of energy for our everyday life and had been passed down from earlier generations to us.
- To enhance students' knowledge to words Bengali culture, folk elements are most important component. In this paper, students will be acquainted with some of the performing arts of Bengal.
- This paper will survey the literary History from modern period to contemporary. Trends in these periods are to be discussed.(i,e:Modern Novel and short stories, Essay literature etc)

Paper VI

- Rabindranath Tagore is the first recipient of Nobel prize in Literature in the Asia continent. So, we tend to introduce some of his literary works in this paper.

Paper VII

- A Text of collected Essays by important Authors to be studied in this course. There will be ten essays to be studied in the whole semester/Courses

Paper VIII

- This paper will highlight the cultural background and history of Bengali Culture ,and history of Sanskrit, and English Literaure also .

BOTANY

Programme specific outcome

- Students develop a holistic knowledge in the undergraduate course starting from archegoniate group, Taxonomy of Angiosperm, Palaeobotany, Anatomy to advanced fields of plant science such as Cell and Molecular Biology, Plant protection , Plant metabolism.

- In practical classes students work out the specimens which help them to understand and to identify the specimens.

- The local and long field excursions help the students to develop knowledge about the local flora and flora of specific phytogeographic region in their natural habitat.

- Students build up awareness and knowledge in environmental related issues such as waste management, biodiversity conservation, pollution monitoring, etc.

- Students after passing post graduate course can explore in various field of research viz. Conservation of Ecosystem, Environmental Disaster Management, herbal drugs and medicinal plants, Host pathogen interaction, crop protection and plant disease management, GIS and remote sensing, Intellectual Property Rights, Quarantine etc.

- Students of UG course get the chance to have an exposure in skill enhancement courses such as Plant breeding, Mushroom culture and elective courses such as Industrial and environmental Biology, Medicinal and Ethno Botany etc . This will open up new avenues and job opportunities for the students .

- The students of Post Graduate Department get a hands on experience in Research during carrying out dissertation work. This helps the students to have research exposure which will be beneficial for those who will join the Ph.D. programme in future.

- The contents of core course and optional courses in PG curriculum are beneficial for the students to get prepared for NET/SET/GATE and also GRE and other competitive examinations.

Course specific outcome

Undergraduate

The undergraduate course in Botany under CBCS credit system has been semesterised in 2018. In each semester the **core courses** have theoretical and practical papers.

Sem I

In Sem I there are two core courses Phycology and Microbiology (CC1) and Mycology and Phytopathplogy (CCII). A brief account on classification, life history and economical importance of different algal and fungal genera are taught in these two papers which help the students to develop a clear concept on these two cryptogamic groups of plant kingdom. Besides, the practical classes the local field excursions enable the students to identify the fungal and algal genera. In Microbiology part the students develop a clear knowledge on different aspects of bacteria and virus. Students learn various culture techniques and bacterial staining method in practical class. In Phytopathology, students study about important plant diseases, host pathogen interaction and plant disease management. The study of Phytopathology is very much essential in the field of crop protection and disease management .

Sem II

In Sem II there are two core courses Plant Anatomy (CCIII) and Archaegoniate (CC IV). The subject Plant Anatomy helps the students to know about Internal structural organisation of plant organs. The students also do practical to study the anatomical details of plant tissue and organs. In archaegoniate paper the students study about Bryophyte, Pteridophyte and Gymnosperm groups of plant kingdom. In this semester students go for a long excursion in a place of higher altitude to observe and identify these groups of plants in their natural habitat.

Sem III

In Sem III there are three core courses. In Palaeoboany and Palynology (CC5) paper the students are taught about plant fossils, pollen structure and applied palynology viz. Forensic palynoloy, aeropalynology etc. In Reproductive Biology of Angiosperms (CC6) the students learn about morphology of angiosperm and embryology. Plant systematics paper (CC7) deals with the Taxonomy of Angiosperms. This is a very important field of Plant Science which deals with Plant nomenclature, System of Classification and Taxonomic families. The students work out on angiosperm specimens in practical class and they also learn to identify plants. A number of local field excursions are in the curriculum during this semester. Students learn to prepare field note book, voucher specimen book and herbarium specimens.

Sem IV

In Sem IV students are offered three core courses. In Plant Geography paper (CC8) students study about plant evolution, plant ecology and plant evolution. Long excursion to a phytogeographic region in India is being carried out in this semester. This field trip helps the students to understand the characteristic flora of that particular phytogeographic region. In Economic Botany paper (CC9) students study about economically rich groups of plant crops viz. cereals, legumes, sugar and starches, spices, beverage, oil and fat, drug yielding plants etc. In Genetics paper (CC10) students get a clear concept on various topics of Genetics. In practical classes the students study about mitotic and meiotic chromosomes.

Sem V

In this semester two core courses are offered. In Cell and Molecular Biology paper (CC11) students come to know about origin and evolution of cells, DNA replication, transcription, translation , gene regulation and recombinant DNA technology. In Practical classes students carry out a number of experiments on Plant Molecular Biology. In Plant Biochemistry (CC12) paper students study about basic molecules of life, energy flow and enzymology and other biochemical processes of plant cell.

Sem VI

There are two core courses in this semester. In Plant Physiology (CC13) paper students acquire knowledge about various physiological processes viz. Photomorphogenesis, plant growth regulators, seed dormancy etc. In plant metabolism paper (CC14) students study about primary and secondary metabolic pathways such as photosynthesis, respiration, nitrogen and lipid metabolism etc.

Skill enhancement course and Discipline specific elective course :

In third and fourth semesters students have to take one skill enhancement course such as Plant Breeding, Mushroom Culture technique, Biofertiliser etc. In fifth and sixth semesters students have to opt for two Discipline specific elective courses in each semester such as Industrial and environmental Biology, Medicinal and Ethno Botany, Plant Biotechnology, Natural Resource Management etc. These special courses will open up new avenues for the students and they will be able to acquire knowledge in the applied fields of Plant Sciences.

CHEMISTRY

PSO1. Understand bonding, physical properties, stereochemistry and reaction mechanism in organic molecules.

PSO2. Understand reactions in unsaturated, carbonyl and associated compounds and organometallics.

PSO3. Study nitrogenous compounds, rearrangement reactions and logical synthesis of organic molecules.

PSO4. Study and analyze organic spectroscopy.

PSO5. Study carbocyles, heterocycles, pericyclic reactions, carbohydrate and biomolecules.

PSO6. Analyze solid binary mixtures; determine boiling points of organic liquid samples; prepare small scale organic compounds; identify pure solid and liquid samples, Separate organic mixture in chromatographic method and analyzes organic compounds by spectroscopy.

PSO7. Understand atomic structure, radioactivity, periodic properties and acid base reactions.

PSO8. Understand chemical bonding, structure and properties of covalent compound, structure, defects and properties and chemical forces of ionic and non ionic crystalline solids.

PSO9. Study preparation, bonding, structure and properties and reactions of compounds of s, p, d and f block elements.

PSO10. Study organometallic and coordination compounds and bioinorganic chemistry.

PSO11. Understand principles of separation techniques, quantitative estimation of metal ion single or present in a mixture, ore and mineral analysis, spectroscopic techniques.

PSO12. Identify cation and anion present in a mixture of inorganic salts, oxides, hydroxides or carbonates.

PSO13. Estimate quantitatively metal ions present in mixture by volumetric analysis.

PSO14. Understand basic principal of thermodynamics, thermochemistry, equilibrium, colligative properties, phase rule and statistical thermodynamics.

PSO15. Study and understand properties of ideal gases; speed, kinetic energy heat capacity, real gases, intermolecular forces, liquefaction.

PSO16. Understand properties of liquid; viscosity and surface tension.

PSO17. Understand principle of quantum mechanics and analyze related phenomenon, study quantum mechanical model.

PSO18. Understand and analyze molecular spectroscopy.

PSO19. Determine physical properties like surface tension, viscosity, partition coefficient, rate constant of a reaction, pKa, pKIn etc.

CO1. Understand physical and chemical properties of chemical compounds and correlate these properties with their structure, bonding, intermolecular forces and other features as explained by different theories and principles of chemistry.

CO2. Understand periodic correlation of properties of metals, nonmetals and metalloids.

CO3. Understand and practice basic principle of analytical techniques used for identification, separation and estimation of chemical species.

CO4. Understand laws of nature and apply them to explain the behavior of solid, liquid and gases and their mixture.

CO5. Understand different laws which guide the physical processes and chemical reactions and measure the parameters involved.

CO6. Understand principle of spectroscopy and analyze molecules by spectroscopic techniques.

CO7. Understand and practice instrumental methods used in chemical analysis.

COMMERCE

PROGRAM SPECIFIC OUTCOMES:

After successfully completing B.Com(H) in Accounting and Finance Specialization(only specialisation offered in our college) :-

PSO1. Students will be able to prepare and regularly maintain books of accounts for any individual or corporate entities.

PSO2. Students will be able to analyse and interpret the financial statements of organizations to depict their financial performance.

PSO3. Students will be capable to perform Tax Management and Tax Planning and will be able to compute income tax liability of an individual assesse.

PSO4. Students will develop drafting skills and writing techniques of business letter, circulars and other formal notices.

PSO5. Students will get the basic structural idea of various Management disciplines, which will help them to perform managerial functions in the future.

PSO6. Students will acquire basic legal knowledge to understand various Acts and draft contracts and other legal documents.

PSO7. Basic knowledge of Accounting Software is acquired by the students.

PSO8. Analysis of Capital Market, Stock Exchange, Financial Instruments and Financial Services are learnt by the students. They acquire working knowledge of the financial markets prevalent in India and financial system currently running in the Indian Economy.

PSO9. Students will acquire economics based knowledge for various strategic investment decision making and savings planning.

PSO10. Students will get the knowledge on Auditing and its quality assurance and gets updated understanding of all the current changes of statutes and laws taking place in the Indian Economy as well as in the World Economy.

COURSE OUTCOMES:

CO1. Proper commerce-based understanding will help in developing rational individuals in the society to deal with relevant economic dilemma.

CO2. Helps the student individually in understanding the concept of Saving-Investment and its impact in the Macro-economic development of the society.

CO3. Updated knowledge of computation and management of direct and indirect taxation helps in curtailing black money and secures the Government's estimated revenue.

CO4. Helps in development of the tertiary sector of the economy by providing rational decision makers, managerial personnel and marketing sales force to the market. Also the upkeep and management of the human resource department of every corporate or non-corporate entity is facilitated with the help of the knowledge gained by studying Financial Management, Human Resource Management and Marketing Management.

CO5. Updated knowledge of Accountancy and Book-keeping at par with the World helps India to shine in the World Economy and encourages the MNCs to invest in India Inc. and in turn develops the overall market and economy of our country.

CO6. The study of Human Resource Management helps in positioning the right person to the right job and in turn increases the efficiency of every sector. It also helps in addressing employees' grievances leading to job satisfaction; stress relief and overall sense of containment of every working individual in the society.

COMPUTER SCIENCE

Program specific Outcomes (PSO):

After successful completion of B.Sc. in Computer Science, students gain the knowledge of the following:

1. An essential skill of problem solving with different dimensions of computer science and computing.
2. Ability to understand the principles and working of computer systems to assess both the hardware and software aspects.
3. Professional skills of software design including familiarity and practical competence with a broad range of programming language and open source platforms.
4. Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm.
5. Ability to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.
6. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
7. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (CO):

1. Study of Computer Fundamentals, Digital Circuits and Basic Electronics enables the students to describe the usage of computers, why computers are essential components in business and society and identify categories of programs, system software and applications.
2. Computer Networks and Data Communication helps the students to utilize the Internet Web resources, evaluate on-line e-business system and solve common business problems using appropriate Information Technology applications. It also gives the knowledge to distinguish various types of network standards and communication software.
3. Study of Numerical Analysis and Discrete Mathematics helps to apply algorithmic, mathematical and scientific reasoning to a variety of computational problems.
4. Study of Software Engineering helps to gather requirements, design correctly, implement and document solutions to significant computational problems and analyze performance standards.

5. Data Structure and Algorithm helps to analyze and compare alternative solutions to computing problems.
6. Study of Computer Organization, helps to learn about the design of computers which includes both overall design, or architecture, and their internal details, or organization.
7. Study of Operating System & System Software helps them to understand how operating system allows a computer's hardware components, including processors and drives, to communicate with its software components, such as applications and data instruction sets.
8. Formal Languages and Automata Theory helps to perform computations on an input by moving through a series of states or configurations.
9. Study of C language can be used for low-level programming, such as scripting for drivers and kernels and it also supports functions of high level programming languages, such as scripting for software applications etc.
10. Study of Java and Python will allow the students to build multi-device, multi-platform app, GUI applications to 3D graphics for games to real-time mathematical simulations.
11. Study of 8085 Microprocessor helps the students to understand the design of personal computers as well as a number of other embedded products. They will understand and devise techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.
12. Computer Graphics and Image Processing will help the students to design abstract, synthetic objects such as mathematical surface in 3D, animations, motion dynamics and update dynamics.
13. Database Management System (DBMS) helps the students to understand how to handle huge volumes of data and multiple concurrent users, data integrity, consistency, security, and appreciable system performance.
14. Study of UNIX helps students to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks, monitor system performance and network activities.
15. With HTML, CSS, PHP and MySQL students will be able to understand the fundamentals of web, can design and develop dynamic, database-driven web applications using PHP. Students will learn how to connect to any ODBC-compliant database, and perform hands on practice with a MySQL database to create database-driven HTML forms and reports etc. Students will also learn how to configure PHP and Apache Web Server. They can also describe the function of JavaScript as a dynamic webpage creating tool.

ECONOMICS

Programme specific outcome:

1. Sound financial understanding and application in day to day life.
2. Understand hoe government helps in mediating between consumers and producers.

3. Understanding international relation in terms of economic co-operation.
4. Addressing various economic problems like unemployment, inflation etc.
5. How economic growth of a country affects in general income of a person.
6. Prescribe methods of improving health, education and other activities of life.
7. Good employment opportunity in teaching, research and industry.
8. Helps in starting new ventures as successful entrepreneurs.

Course outcome:

1. Introductory microeconomics:

This course is designed to expose the students to the basic principles of microeconomic theory. The emphasis will be on thinking like an economist and the course will illustrate how microeconomic concepts can be applied to analyze real-life situations.

2. Mathematical method for economics:

This is the first of a compulsory two-course sequence. The objective of this sequence is to transmit the body of basic mathematics that enables the study of economic theory at the undergraduate level, specifically the courses on microeconomic theory, macroeconomic theory, statistics and econometrics set out in this syllabus. In this course, particular economic models are not the ends, but the means for illustrating the method of applying mathematical techniques to economic theory in general. The level of sophistication at which the material is to be taught is indicated by the contents of the prescribed textbook.

This course is the second part of a compulsory two-course sequence. This part is to be taught in Semester II following the first part in Semester I. The objective of this sequence is to transmit the body of basic mathematics that enables the study of economic theory at the undergraduate level, specifically the courses on microeconomic theory, macroeconomic theory, statistics and econometrics set out in this Syllabus. In this course, particular economic models are not the ends, but the means for illustrating the method of applying mathematical techniques to economic theory in general. The level of sophistication at which the material is to be taught is indicated by the contents of the prescribed textbook.

3. Introductory macroeconomics:

This course aims to introduce the students to the basic concepts of Macroeconomics. Macroeconomics deals with the aggregate economy. This course discusses the preliminary concepts associated with the determination and measurement of aggregate macroeconomic variable like savings, investment, GDP, money, inflation, and the balance of payment.

4. Intermediate microeconomics:

The course is designed to provide a sound training in microeconomic theory to formally analyze the behaviour of individual agents. Since students are already familiar with the quantitative techniques in the previous semesters, mathematical tools are used to facilitate understanding of the basic concepts. This course looks at the behaviour of the consumer and the producer and also covers the behavior of a competitive firm

5. Intermediate macroeconomics:

This course introduces the students to formal modeling of a macro-economy in terms of analytical tools. It discusses various alternative theories of output and employment determination in a closed economy in the short run as well as medium run, and the role of policy in this context. It also introduces the students to various theoretical issues related to an open economy.

6. Statistical method for economics:

This is a course on statistical methods for economics. It begins with some basic concepts and terminology that are fundamental to statistical analysis and inference. It then develops the notion of probability, followed by probability distributions of discrete and continuous random variables and of joint distributions. This is followed by a discussion on sampling techniques used to collect survey data. The course introduces the notion of sampling distributions that act as a bridge between probability theory and statistical inference. The semester concludes with some topics in statistical inference that include point of interval estimation.

7. Intermediate microeconomics 2:

This course is a sequel to Intermediate Microeconomics I. The emphasis will be on giving conceptual clarity to the student coupled with the use of mathematical tools and reasoning. It covers general equilibrium and welfare, imperfect markets and topics under information economics.

8. Intermediate macroeconomics 2:

This course is a sequel to Intermediate Macroeconomics I. In this course, the students are introduced to the long run dynamic issues like growth and technical progress. It also provides the micro-foundations to the various aggregative concepts used in the previous course.

9. Indian economy 1:

This course provides a comprehensive introduction to basic econometric concepts and techniques. It covers statistical concepts of hypothesis testing, estimation and diagnostic testing of simple and multiple regression models. The course also covers the consequences of and tests for misspecification of regression models.

10. Development economics 1:

Using appropriate analytical frameworks, this course reviews major trends in economic indicators and policy debates in India in the post-Independence period, with particular emphasis on paradigm shifts and turning points. Given the rapid changes taking place in India, the reading list will have to be updated annually.

11. Indian economics 2:

This is the first part of a two-part course on economic development. The course begins with a discussion of alternative conceptions of development and their justification. It then proceeds to aggregate models of growth and cross-national comparisons of the growth experience that can help evaluate these models. The axiomatic basis for inequality measurement is used to develop measures of inequality and connections between growth and inequality are explored. The course ends by linking political institutions to growth and inequality by discussing the role of the state in economic development and the informational and incentive problems that affect state governance.

12. Development economy 2:

This course examines sector-specific polices and their impact in shaping trends in key economic indicators in India. It highlights major policy debates and evaluates the Indian empirical evidence. Given the rapid changes taking place in the country, the reading list will have to be updated annually.

This is the second module of the economic development sequence. It begins with basic demographic concepts and their evolution during the process of development. The structure of markets and contracts is linked to the particular problems of enforcement experienced in poor countries. The governance of communities and organizations is studied and this is then linked to questions of sustainable growth. The course ends with reflections on the role of globalization and increased international dependence on the process of development.

ENGLISH

Programme Specific Outcomes

- The Department of English sees itself as a centre for intellectual and creative thinking which will help students to become sensitive human beings possessing aesthetic awareness. Partaking of the legacy of a 189 year old department it attempts to redefine the parameters of knowledge dissemination within the rich cultural heritage of the College. In the process students will imbibe more humane qualities which will equip them to deal with the challenges of a fast paced world of mechanical existence.

- Analytical skills in linguistic communication and literary criticism enable them to analyse oral and written discourse of various genres, social, cultural, political and historical contexts and use them in advanced studies in a wide range of corporate, communication, research and knowledge fields.
- Students who have graduated from the department of English have used their newly acquired knowledge practices and aesthetic expressions to engage in research work and higher studies. Others have used their writing and reading skills to take up professions like teaching, journalism, copywriting, editing, publishing, advertising and marketing as well as analogous disciplines like theatre and film studies. Knowledge of English and precise communication skills stand them in good stead in professions like banking, public administration and human resource.

Course Outcomes

- Canonical English Literature gives the students a solid grounding in British and American Literature that helps them to be grounded research scholars and teachers.
- Stress on the Classical Papers and History of Literature gives a synchronic view of literature and helps contextualize.
- The innovative and interdisciplinary courses like Popular Literature help the students to expand their expertise over various other disciplines which help them to survive in an increasing interdisciplinary world of academics.
- Postcolonial, Indian and Partition literature makes the students aware of their immediate surroundings and expands the possibility of relevant and localized research.
- The courses on translation help the students to bridge the gap of language in academics and daily life. In a multilinguistic country like India reading literature of various languages help the students to diversify their knowledge base.
- The Skill Enhancement Courses (SEC) explores the practical side of English language in a globalised world and makes them ready for the demands of the work place. It also helps them to understand the process of business communication and augments their competency in reading and writing skills.
- Courses like American Literature, Philology and Linguistics broaden the scope of the discipline and acquaint students with the subsidiary branches of English studies.
- The DSE courses with a focus on specific target areas helps students to gain specialization in specific fields that gives them an edge in the world of academia.

HISTORY

Programme specific Outcome

After completing History Honours Undergraduate Course

1. Students shall be able to demonstrate thinking skills by analyzing, synthesizing, and evaluating historical information from multiple sources.
2. Students will develop the ability to distinguish between fact and fiction while understanding that there is no one historical truth.
3. Students will produce well researched written work that engages with both primary sources and the secondary literature.
4. Students will develop an informed familiarity with multiple cultures.
5. Students will employ a full range of techniques and methods used to gain historical knowledge.
6. Students will develop an ability to convey verbally their historical knowledge.
7. Students will demonstrate their understanding of cause and effect along with their knowledge of the general chronology of human experience.

Course Outcomes

1. Study of Historiography helps in constructing original historical arguments based on primary source material research along with the development of the ability to convey verbally thesis research and relevant historiography and theory.
2. The Study of Early World History and Cultures proposes the idea that humankind as a whole has a history to be investigated and that a world history course may be more than study of various "cultures," each disconnected from the others. It encourages to think explicitly about the aims of world history education and about the knowledge and understandings It is conceived on the premise that students will achieve will greater competence in world history and more successfully meet content and performance standards, if they are guided to relate particular subject matter to larger patterns of historical meaning and significance.

3. Students will acquire a sophisticated awareness of the relationships that develop through time between political, social, economic, cultural, intellectual, and religious factors, weaving into "patterns" and trends.
4. Students will learn the methods and techniques of research and analysis in the discipline of history, including the "social sciences" and "humanities" traditions as well as the "rules of evidence" employed in historical thinking and writing – all components of "critical thinking."
5. Students will acquire a rudimentary sense of historiography – historical argumentation and debate – on key questions of professional research.
6. Students will develop communications skills to express historical perspectives, including writing and oral presentations of expression.

HINDI

Program Specific Outcomes

PSO1. Understandthe gradual progress of language and its literature with orientations and changesoccurred during the flow of time and history.

PSO2. Analyse the relationship among language, literature and society.

PSO3. Understand the behavioral approach of human beings.

PSO4. Perform more scientifically for the betterment of mankind by learning functional hindi and basics of journalism.

Course Outcomes

CO1. Describe the history of hindi literature with evolution of language.

CO2. Write down the characteristics of ancient and medieval literature in context of different socio-economic environments.

CO3. Identify the modern literary reactions towards the changes of society.

CO4. Write down the characteristics of official language of India and its implementation in society.

MATHEMATICS

Program Specific Outcomes (PSO)

10. Develop the skill to deal with the abstract ideas of Mathematics.
11. Become proficient in writing proofs.
12. Expertise in problem solving.
13. Acquire the skill to pursue career not only in school education but also in business, civil services, banking, finance etc.
14. Can continue study of Mathematics at the post graduate level and more.
15. Can apply Mathematical methods in problems of Mathematics and related fields of science and engineering.
16. Learn how to teach Mathematics in undergraduate level.
17. Develop the ability of analytical and logical thinking which will help them in all aspects of life.

Course Outcomes (CO)

1+1+1 System

PAPER I

CLASSICAL ALGEBRA, MODERN ALGEBRA I, ANALYTICAL GEOMETRY OF TWO ANF THREE DIMENSIONS AND VECTOR ALGEBRA:

Learn concepts of Classical Algebra such as Complex numbers, Inequality, Integers, Theory of Equations, introductory ideas of Modern Algebra such as Set, Mapping, Relations and introduction of Group Theory and Analytical Geometry which includes Transformation of axes, Pair of Straight Lines, Circle, Ellipse, Parabola, Hyperbola, Rectangular Cartesian coordinates in Space, Equations of Plane, Straight lines in Space, Position Vectors, Vector Products, Application of Vector Algebra, Vector Equations

PAPER II

ANALYSIS I , EVALUATION OF INTEGRALS, LINEAR ALGEBRA AND VECTOR CALCULUS I:

Get the basic knowledge of Analysis including Real Number System, Set and Sequences of Real Numbers, Countability of Sets, Continuity of Real Valued Functions of Real Variables. Apart from that Methods of Evaluation of Definite and Indefinite Integrals, Matrices, Determinants, Vector Space, Vector Differentiation, Scalar and Vector Field.

PAPER III

MODERN ALGEBRA II AND LINEAR PROGRAMMING, GAME THEORY, ANALYSIS II AND DIFFERENTIAL EQUATIONS I:

In extension to the Modern Algebra Course in Paper I student learns Cosets, Cyclic Groups, Rings and Fields. Learn theories and problem solving mechanisms of Linear Programming Problems and Game Theory. Also as an extension of Paper II Analysis course, learns the Infinite Series of Real Numbers, Derivatives of Real Valued Functions of Real Variables. Finally methods to solve ordinary Differential equations and introduction to Partial Differential Equations

PAPER IV

REAL VALUED FUNCTIONS OF SEVERAL VARIABLES, APPLICATION OF CALCULUS, ANALYTICAL GEOMETRY OF THREE DIMENSIONS II, ANALYTICAL STATICS I AND ANALYTICAL DYNAMICS OF A PARTICLE I: Learn concepts of function of several variables, for example Point Sets, Limit, Continuity, Differentiability, Jacobian etc. Then Application of Calculus which involves Asymptotes, Curvature, Envelopes, Concavity, Convexity, Sphere, Cone, Cylinder,

Ellipsoid, Hyperboloid, Paraboloid, Surface of Revolution, Transformation of Axes, Friction, Astatic Equilibrium, Newton's Laws, Impact of Elastic Bodies, Accelerations, Damped Harmonic Oscillators, Motion in a Plane under Laws of Resistance,

PAPER V

ANALYSIS III, LINEAR ALGEBRA II, MODERN ALGEBRA II, TENSOR CALCULUS, DIFFERENTIAL EQUATION II OR GRAPG THEORY:

Get ideas of Compactness in R, Functions of Bounded Variations, Riemann Integration, Sequence and Series of Real Functions, Linear Transformation, Normal Subgroup, Homomorphism, Isomorphism, Tensor Calculus, Laplace Transformation and Series Solution of Ordinary Differential Equations or Graph Theory

PAPER VI

VECTOR CALCULUS II, ANALYTICAL STATICS II, ANALYTICAL DYNAMICS OF A PARTICLE II, HYDROSTATICS AND RIGID DYNAMICS:

Learns advance Vector Calculus, advance Analytical Statics and Dynamics, Hydrostatics and Rigid Dynamics

PAPER VII

ANALYSIS IV, METRIC SPACE, COMPLEX ANALYSIS, PROBABILITY AND STATISTICS:

Learns Improper Integral, Fourier Series and Multiple Integrals, Metric Space and Complex Functions and probability and statistical methods in detail.

PAPER VII

NUMERICAL ANALYSIS, COMPUTER PROGRAMMING AND PRACTICALS:

Familiarize oneself with the application of method of estimation in absence of exact solution or when finding exact solution is tough and also learn to write the computer programming of the numerical methods in C or Fortran, fundamentals of Computer Science and Boolean Algebra.

Course Outcomes (CO)
CBCS System

CC1

CALCULUS, GEOMETRY AND VECTOR ANALYSIS: Learn the foundational knowledge of Calculus, Geometry and Vector Analysis and learn to plot graphs of functions , sketch parametric curves, trace conics etc using free software.

CC2

ALGEBRA: Develop the basic ideas of Classical Algebra(Complex Number, Theory of Equation, Inequality), Abstract Algebra(Relation, Mapping, Integers) and Linear Algebra(Rank of a Matrix, System of Linear Equations etc).

CC3

REAL ANALYSIS: Get the ideas of Real Numbers, Countable and Uncountable Sets, Bounded and Unbounded Sets, Limit Points, Interior Points, Real Sequence, Subsequence in detail and learn to plot sequences and verify theorems through plotting of sequences.

CC4

GROUP THEORY-I: Learn Group, its properties and examples, Subgroup, ita properties and examples, Cyclic Group, Permutation, Quotient Group, Homomorphisms, Isomorphisms.

CC5

THEORY OF REAL FUNCTIONS: Acquire the knowledge of Limit, Continuity and Differentiability of Real Functions.

CC6

RING THEORY AND LINEAR ALGEBRA-I: Learn the definition of Ring, Subring, Integral Domain, Field, Ideals, Ring Homomorphism and their properties and theorems in the Ring Theory and in Linear Algebra, the fundamentals of vector Space, Linear Transformation, Algebra of Linear Transformation, Eigen Values, Eigen Vectors.

CC7

ORDINARY DIFFERENTIAL EQUATION & MULTIVARIATE CALCULUS-I: Learn methods to solve Ordinary Differential Equations and introductory ideas of Multivariate Calculus(Concept of Neighbourhood, Limit Point, Interior Point, Chain Rule, Directional Derivatives).

CC8

RIEMANN INTEGRATION & SERIES OF FUNCTIONS: Get the knowledge of Riemann Integration, Improper Integral, Sequence and Series of Functions, Power Series, Fourier Series.

CC9

PARTIAL DIFFERENTIAL EQUATION & MULTIVARIATE CALCULUS-II: Learn methods to solve Partial Differential Equations (PDE) and some problems involving PDE and in Multivariate Calculus, learn Multiple Integrals, Vector Field, Divergence, Curl, Green's Theorem, Stoke's Theorem and Divergence Theorem.

CC10

MECHANICS: Learn Coplanar Forces in general, an arbitrary force system in space, Equilibrium in the presence of Sliding Friction force, Virtual Work, Stability of Equilibrium, Kinematics of a particle, Newton Laws of Motion and Law of Gravitation, Problems in Particle Dynamics, Planar motion of a particle, Motion of a particle in three dimensions, Linear Momentum Principle, Angular Momentum Principle, Energy Principle.

CC11

PROBABILITY & STATISTICS: Learn probability and statistical methods in detail and also learn to do the graphical representation of data.

CC12

GROUP THEORY-II & LINEAR ALGEBRA-II: Get the idea of Automorphism, External Direct Product, Inner Product Spaces and Norms, Dual Spaces, Eigen Spaces.

CC13

METRIC SPACE & COMPLEX ANALYSIS: Get the concept of Metric Spaces, Compactness, Connectedness and in Complex Analysis Stereographic Projections, Differentiability, Power Series, Complex Integration etc.

CC14

NUMERICAL METHODS: Familiarize oneself with the application of method of estimation in absence of exact solution or when finding exact solution is tough and also learn to write the computer programming of the numerical methods.

- From the elective **SKILL ENHANCEMENT COURSES** one can learn C, C++, Scientific Computing with SageMath and R and Mathematical Logic.

- From the elective **DISCIPLINE SPECIFIC ELECTIVE COURSES** one can get an overview of specialized sections of Mathematics which will help to choose the right track for future.

MICROBIOLOGY

Programme Specific Outcome

Microscopic living organisms, bacteria, viruses, fungi, and protozoa, have a profound influence on our daily lives, including our health, food, fuel, and the environment. Microbiology is the study of microorganisms including, bacteria, viruses, algae, fungi and protozoa. Microorganisms are most famous for their ability to cause diseases, however, microorganisms are also vital to agriculture, industry and ecology. In fact, life on Earth would not survive without microorganisms.
Microbiology as an undergraduate degree course offers a number of avenues to the students. It includes both theoretical as well as practical aspects.

By the end of this course, the students will be able to:

1. Understand the contributions of various scientist in microbiology and scope of various branches, understand various kinds of prokaryotic & eukaryotic microbes and their interactions , details of Bacteriology, which includes the structure, cellular organization, growth, reproduction and various culture methods

2. Comprehend the importance of organic compounds found in living cells and also their biochemistry. Understand and explain various processes of metabolism of carbohydrates amino acids and vitamins.

3. Explain the cellular structures, functions, cell cycle, cell signaling, cell division and cancer biology.

4. Make out the details of viral lifecycle and viral genetics.

5. Learn about environmental aspects of microbiology.
6. Explain DNA, RNA and protein structure and their synthesis, basic concepts of gene and their regulation of action.
7. Have clear concept about Immune system and its function.
8. Understand the concept of disease development, spread, control and eradication from society.

9. Enhance their idea on industrial microbiological processes, application of microbes in food industry, learn details about quality control of various products and control contamination in industries.
10. Have hands on experience to microbiological processes through various practicals and projects.

Course specific outcome

CBCS system

Semester 1

In Semester 1 there are two core course papers CC1 and CC2.

In the core course theory paper CC1, students will be given the idea about introductory Microbiology and the idea about different groups of microorganisms for example viruses, bacteria, algae, fungi and protozoa. Different characteristic features of each group of Microorganisms with examples will be taught. Students in this core course will also be able to explore the interesting history of Microbiology and the future prospect of Microbiology.

In the CC1 practical part students will learn the use of different important instruments like autoclave, BOD Shaker, Hot Air Oven, light microscope etc. that are essential parts of Microbiology Laboratory and also about the good practices of Microbiology Laboratory. Students will observe also the morphology of different classes of Microorganisms .The assessment of sterility will also be done by using different sterilizing instruments.

In the core course Theory paper CC2, students will be taught the idea of cellular organization of Bacterial cell along with the growth, nutrition and reproduction of bacteria. This paper also illustrates use of different microscopes and microbial pure culture isolation techniques. In this core paper Bacterial systematics will teach the students about the recent approaches of Bacterial taxonomy with more extensive discussions on some selected important Archeal and Eubacterial groups.

In the core course Practical paper CC2 students will learn to prepare different microbial media and different staining techniques of bacteria. This paper will also teach the motility test and estimation of colony forming units of Bacteria.

In short, Semester 1 core course CC1 and CC2 will introduce the idea of Introduction of Microbiology with special emphasis on Bacteriology.

Semester 2

Semester -2 in CBCS consists of two core course papers namely CC3 (Biochemistry) and CC4 (Cell Biology).

After introductory Microbiology (in Semester 1) , semester 2 - CC3 theory part deals with the introduction of different bio-molecules for examples carbohydrates ,lipids, proteins, enzymes and vitamins .It also includes the views of different laws of bioenergetics.

Practical Part will help the students to learn about properties of water and to calculate different sums on bioenergetics. Apart from this students will perform different qualitative and quantitative tests for different bio-molecules and also study the structure of Proteins. In this practical paper students will experience the study of enzyme kinetics and of different factors on enzyme activity. Students will also elucidate estimation of one vitamin in this part.

In CC4 theory part students will be given illustrated views on cell biology which includes structure and organization of eukaryotic and prokaryotic cells, detailing of nucleus, protein sorting and transport, cell signalling, cell cycle, cell death and cell renewal.

In CC4 practical part students will study different stages of meiosis and mitosis. Through this practical paper students will explore the study of animal and plant cells and the structure of cell organelles. They will also perform the cyto- chemical staining of DNA and study of polyploidy. Demonstration of the presence of mitochondria also will be done in this part.

In short, in semester 2, CC3 and CC4 will expose students to different aspects of biochemistry as well as of cell biology.

Semester 3

In Semester 3, there are three core course papers CC5 (Virology), CC6 Microbial physiology and metabolism, CC7 (Molecular Biology) and one skill enhancement elective course (Microbial Quality Control in Food and Pharmaceutical Industries.

After studying Virology (CC5), students will learn about the nature and properties of various viruses. They will study about the viriods, satellite viruses, prions, cultivation of viruses, bacteriophage, lytic and lysogenic phages. Students will also discuss in details about viral transmission, salient features of viral nucleic acids, oncogenic viruses and prevention and control of viral diseases.

From Microbial physiology and metabolism (CC6) students will learn about microbial growth and effect of various environmental parameters on growth. Students will also study the different modes of nutrient uptake in bacteria, about their chemoheterotrophic, chemolithotrophic, phototrophic and nitrogen metabolism.

From Molecular biology (CC7) students will learn about structure of DNA and RNA: Watson and Crick model, salient features of double helix, types of DNA and replication of DNA. Students will discuss in details about transcription in prokaryotes and eukaryotes, post transcriptional processing, translation and regulation of gene expression.

In SEC (Microbial quality control in food and pharmaceutical industries) students will learn about laboratory safety rules, culturing and determining microbes in food and pharmaceutical

samples. This paper will also teach about detection of specific microbes in different media and food safety and microbial standards for different foods and water.

Semester 4

In semester IV, students are offered three core courses and one Skill Enhancement Elective Courses (SEC). In CC 8 theory, they learn about Microbial Genetics. In Microbial Genetics they are able to gain knowledge about the genome structure of *E. coli, Saccharomyces, Tetrahymena*. Te details mechanism of genetic mutations and repair. They will be taught about the structure, types and characteristic features of plasmids, which is the most important feature to be used as a vector in genetic engineering, various mechanisms of genetic exchange like transformation, conjugation, and transduction. Students will learn phage genetics , features of T4 genetics , genetics of lytic and lysogenic cycles. Transposable elements and uses of transposons and transposition will also be taught. In CC 8 Practical paper, students can have hands on experience on mutagenesis, AMES test, Isolation of Plasmid DNA, bacterial conjugation, demonstration of bacterial transformation and transduction.

In CC-9, students are taught about Environmental Microbiology (Theory). The habitat is an important concept in microbiology in particular because microorganisms are greatly affected by where they live. Here the students learn Microbial habitats — including soils, rivers, lakes, oceans, on the surface of living and dead things, inside other organisms, on man-made structures, and everything in between. They are also taught how microorganisms interact with each other and can be physically associated with another organism in a variety of ways and also their roles in maintaining biogeochemical cycles. After studying the course, students will gain knowledge of various means of water treatment and waste management. Through the practicals students will have experience on how to Analysis of soil, Isolation of microbes from soil, quality assessment of water, determination on activities of some important enzymes and Isolation of *Rhizobium* the nitrogen fixer from root nodules.

The CC-10 core course mainly deals with recombinant DNA Technology. Here students learn all the tools and strategies used in genetic engineering as well as the technique of molecular cloning, various methods of Polymerase Chain Reaction, methods of production of DNA library and application of recombinant DNA Technology in industry, in various fields for human welfare. The practicals of this paper helps a student to know most of the basic techniques of Recombinant DNA Technology like PCR, Restriction Digestion, Ligation, Molecular cloning, blotting, sequencing etc. In Skill Enhancement course or SEC in semester – 4, students are offered either food fermentation techniques or microbiological analysis of air and water. Students have to opt for any one of the courses offered. Both the courses give the students an exposure to the techniques employed in Food industry and also in quality control measures employed in ar and water sanitation. After learning the food fermentation techniques, students gain knowledge about production of various fermented foods in industries .If the students opt for the 2nd elective, they learn about

Aeromicrobiology, Air Sample Collection and Analysis, Water Microbiology, Microbiological Analysis of Water, various control measures that one takes to sanitize air and water.

Semester 5

In Semester 5 there are two core course papers: (CC11) Food and dairy Microbiology, (CC12) Industrial Microbiology and two Discipline specific Elective (DSE) papers: DSE A1 Microbial Biotechnology and DSE B2 Microbes in sustainable agriculture and development.
After studying Food and dairy Microbiology (CC11), students will acquire knowledge about the intrinsic and extrinsic factors affecting the growth and survival of microbes in food and dairy products, how various fruits, vegetables, poultry and dairy products get spoilt. This paper gives an insight about the different methods of food preservation and about various fermented foods. After studying this paper, students will gain knowledge about various food borne diseases: causative agents, symptoms and preventive measures. Students will also learn about food sanitation and control.

The paper Industrial Microbiology (CC12) will teach the students about the various industrially important strains, their sources, their isolation, preservation, improvement and maintenance. Students will get to know about the different kinds fermentation processes and about the various biofermentors used in industry. This paper will also give an insight about the role of microbial fermentation in different products such as Vitamin B12, enzymes, penicillin, wine etc.

From DSE papers students will learn about the applications of microbial biotechnology in human therapeutics, agriculture and food industry. This paper will teach the students about production of recombinant vaccines, biopesticides, bioethanol, biodiesel and about bioremediation. Students will also learn about intellectual property rights. From the other paper students will learn about microbial activity in soil, how microbes are used as agents against plant pathogens, insects etc. Students will study about genetically modified crops and their advantages.

Semester 6

In Semester 6 there are two Core Course (CC) papers CC13 – Immunology and CC14 – Medical Microbiology and two Discipline Specific Elective (DSE) papers.

In the course of Immunology, students will get an insight about the role of many important scientists who have contributed in the development of this field of immunology. They will learn about the innate and adaptive immune systems of our body and also about the cells and organs of the immune system. They will get a detail idea about the structural and functional features of antigens and antibodies and will learn about different immunological techniques involving their interactions. Students will also learn about different pathways and types of immunological

responses exhibited by the body under different conditions. They will also get to know about different immunological disorders and tumor immunity.

In the Medical Microbiology paper, students will learn about the normal microflora of the human body and the host pathogen interactions. They will also learn how the clinical samples are being collected, transported and processed for the diagnosis and will study about some diagnostic techniques. They will get a detailed insight for some important bacterial, viral, protozoal and fungal diseases and the antimicrobial agents which can be used against them for their treatment.

In the DSE papers the students will learn about the concepts of plant pathology and will know about the contribution of some important scientists in the said field. They will study about the host pathogen interactions and also about many significant plant diseases and ways to control them. In the other DSE paper students will get a practical idea about how experiments are designed and performed and will learn about different techniques for the same. This will increase their critical thinking and reasoning abilities.

Course specific outcome (CBCS - General)

Semester I (GE- 1)

In this semester students are mainly introduced to scope of Microbiology. They learn the basic of Microbiology like History of Development of Microbiology, where they are mainly introduced to eminent scientists of Microbiology, diverse forms of microorganisms like algae, fungi, protozoa, viruses, various methods of microscopy. They aquire good knowledge on different methods of sterilization, impacts of microbes in human health & environment, industrial microbiology, and food and dairy microbiology. In practical they learn about Microbiology Laboratory Management and Biosafety, Preparation of culture media, Sterilization of medium, Study of different shapes of bacteria, Study of *Rhizopus* , *Penicillium*, *Spirogyra* , *Chlamydomonas, Amoeba*, *Entamoeba*, *Paramecium* and *Plasmodium* using permanent mounts.

Semester II (GE-2)

In this paper students are taught about the bacterial size, shape, morphology, growth and control. Students learn about the various culture media and different techniques for isolation of bacteria such as streaking, serial dilution and plating methods etc. Students are also taught about bacterial systematic and taxonomy, properties of viruses, isolation and cultivation of viruses, morphological characteristics of viruses, bacteriophages and role of viruses in diseases and its prevention.

Semester III (GE-3)

This paper teaches about microbial metabolism. Here students are taught how bacterial growth is measured, various environmental parameters effecting growth such as oxygen concentration, pH,

temperature etc. Students are also taught about the different mode of transportation across plasma membrane in bacteria. Students learn about concept of aerobic, anaerobic respiration, fermentation, electron transport chain, chemolithotrophic, phototrophic and nitrogen metabolism.

Semester IV (GE- 4)

In this semester students are mainly taught – Microbial Genetics. The students will learn the basic structures of genetic materials that are DNA and RNA and will have a clear idea about composition of genome of various organisms, DNA replication, mutation and repair, transcription, translation, genetic regulation of transcription. Students learn about various methods of prokaryotic recombination process and mapping of prokaryotic genes and also about plasmids and transposons. In practicals students will mainly be taught the basic techniques of Molecular Biology, like DNA, RNA structures, replication, their estimation methods, gel electrophoresis etc. and also learn about te effects of mutagens on bacterial cells.

Course Outcome (1+1+1) system

1. Microbiology as a 3-years degree course offers various fields of study. In the 1st year, it teaches basic structure and functions of microorganism, studies of their growth and reproduction and very basics of Biochemistry.

2. After studying the basics of Microbiology, in the 2nd year they learn the application of microorganisms in different fields like Food processing and Dairy Industry, Agricultural industry, public health and hygiene and pharmaceutical industry.

3. In 3rd year, they learn the application of microbes in recombinant DNA technology and Industrial Microbiology. They get to know a lot about the microbes being the causative agents of different diseases. They also learn about the immune system in mammals.

4. After studying all these in detail most of the students go for post graduation and higher studies. (They mainly go for research and get established in different biotechnological as well as pharmaceutical industries). Many of our ex-students are successfully doing their research work and many are placed in different hospitals and industries as microbiologist.

PHILOSOPHY

With a well-balanced proportion of diverse concerns of contemporary philosophy and cultivating synchronization between tradition and modern thought we encourage our students to become dedicated, responsible and help them build career in the world of academics, bureaucracy and

mass communication. The department is proud to be associated with excellent students and faculty members. Our graduate program produces students with comprehensive knowledge in different branches of the subject.

Program specific Outcomes:

After successfully completing B.A. in Philosophy:

1. Students will be able to explain philosophical texts and positions accurately, to identify and apply philosophical research methods consistently, to articulate and defend precise philosophical positions.

2. Students will be able to apply their philosophical learning to important public issues and to articulate why philosophical understanding is valuable in such debates.

3. Students will develop their own philosophical areas of interest and investigate them from various perspectives.

4. Students will attain the research skills necessary for writing a research paper that engages with primary and, where applicable, secondary literature on a topic in philosophy.

5. Students will be able to describe the ways in which the formal techniques of logic are important to philosophical research.

6. Students will acquire reading skills necessary to understand and critically engage with historical and contemporary philosophical texts.

7. Students will be aware of the existence of multiple philosophical traditions, and will be able to reflect on the cultural specificity of some of their own concepts and values.

8. Students will be able to explain epistemological concepts such as the nature of knowledge, justification, evidence and skepticism, and to summarize and evaluate major philosophical positions in relation to each.

Course outcomes: (CBCS System)

Indian Philosophy: CC1, CC3, CC11, CC13

1.Students will read and critically assess the work of central thinkers in the history of Indian philosophy.

2.Students will explore and understand the historical development of major Indian philosophical ideas.

3.Students will develop a critical understanding of various key concepts in philosophy such as ‘prama’, ‘pramana’, ‘prameya’, ‘manas,’ ‘jiva’ ‘jagat’, ‘ishwara’ ‘karma’, ‘janmantara’, and ‘vedic authority’.

Western Philosophy: CC2, CC4, DSE-David Hume, SEC B1

1.Students will read and critically assess the work of central thinkers in the history of western philosophy.

2.Students will explore and understand the historical development of major western philosophical ideas.

3.Students will develop a critical understanding of various key concepts in philosophy such as 'substance', 'God', 'scepticism', 'mind-body problems', 'man and the god relation' and 'Universal '.

Western Metaphysics: CC10, DSE Analytic Philosophy

1. Students will read and critically assess the work of central thinkers in the history of western metaphysics.

2. Students will explore and understand the historical development of major western metaphysical ideas.

3. Students will develop a critical understanding of various key concepts in philosophy such as 'reality', 'mind,' 'causal theory', 'evolution theory', and different views on metaphysical thought of the philosophers.

Ethics: CC12, CC14

1. Students will learn to identify and evaluate ethical principles, values and traditions of moral reasoning.

2. Students will learn to identify and evaluate critically the ethical foundations of key social institutions and professions with a view toward social justice.

3. Students will be able to explain and discriminate between major approaches to moral philosophy such as consequentialism, deontology and virtue ethics, and to summarize and evaluate the views of at least one philosopher associated with each.

Logic: CC8, CC9, SEC A1

1.A solid understanding of the basic concepts of logic, and in particular what it means for an argument to be valid, and the related notion of what it means for a set of statements to be consistent.

2.The ability to apply formal techniques and systematically codify deductively valid arguments.

3.The ability to translate natural language sentences into precise symbolic form and rigorously evaluate standard inferences.

4.Acquire a firm foundation for the study of other disciplines where logic plays an important role (mathematics, computer science, formal semantics in linguistics).

5.Generic analytical and critical thinking skills, including: the ability to identify the argument in a piece of prose and analyse its logical structure.

Psychology: CC5

1.Application of knowledge with critical thinking skills: Students should be able to use critical thinking to evaluate and interpret evidence, and to apply psychological concepts, theories, and research findings to individual, social, and cultural issues.
2. Study of Psychology will help students to understand themselves and others better and to solve, to a great extent, their own problems. Mutual understanding and respect will produce a society where peace and harmony will prevail.

Social and Political Philosophy: CC6
1. Students will be able to explain philosophical texts and positions accurately, to identify and apply philosophical research methods consistently, to articulate and defend precise philosophical positions, and to anticipate and rebut objections to those positions.
2. Students will be able to apply their philosophical learning to important public issues and to articulate why philosophical understanding is valuable in such debates.
3. Students will develop their own philosophical areas of interest and investigate them from various perspectives.
4. Students will attain the research skills necessary for writing a research paper that engages with primary and, where applicable, secondary literature on a topic in philosophy.
5. Students will acquire reading skills necessary to understand and critically engage with historical and contemporary philosophical texts.
6. Students will be aware of the existence of multiple philosophical traditions, and will be able to reflect on the cultural specificity of some of their own concepts and values.
7. Students will be able to explain and discriminate between major approaches to political philosophy such as Libertarianism, Marxism, Liberalism and Communitarianism, and to summarize and evaluate the views of at least one philosopher associated with each.

Philosophy of Religion: CC7
1. Students will be able to read complex texts from a variety of traditions
2. Students will understand and be able to apply the methodological tools used in the study of religion including textual analysis, sociology of religion, anthropology of religion and comparative religions
3. Students will understand the basic features of Western, Eastern and indigenous religious traditions, be able to recognize the foundations of traditions and be able to compare them.

3 Year Degree Course (1+1+1) system

Course outcomes:

1. Study of Ethics or Moral Philosophy will produce morally upright individuals who are socially concerned and sensitive to moral issues.

2. Study of Psychology will help students to understand themselves and others better and to solve, to a great extent, their own problems. Mutual understanding and respect will produce a society where peace and harmony will prevail.
3. Study of Western and Indian Philosophy will help students to develop their own Philosophy of life and to think critically.
4. Study of Logic enables clear thought through a rigorous demand for truthfulness. The relevance of Logic to everyday life is that its use improves the likelihood of satisfactory outcomes in the day-to-day decisions each person makes.
5. Study of Sociology has a great value especially in modern complex society. Sociology has great practical importance in the sense that it keeps us up to date on modern social situations and development.

PHYSICAL EDUCATION

Program Specific Outcomes

1. Understand the behavioral approach of human beings.

2. Students will have set their foundation to persue their higher education in physical education.

3. After completing Graduation you can take up B.P.Ed or M.P.Ed or M.Phil or P.hd or even become a Sports Officer, School teacher & College teacher.

Course Outcomes(CO)

1. To understand the needs, scope & importance of physical education.

2. To understand the relationship between physical education & general education.

3. To understand the role of physical education in modern society.

4. To understand the philosophical foundation of physical education idealism, pregmatism, naturalism & existentialism.

5. To know the history of physical education in ancient times & in modern time & with reference to India & the world.

6. To know various national & international sports movements.

7. To know the contribution to the growth of physical education by the various physical educators.

8. To understand the anatomy & physiology cell, tissues, various organs & organ systems of the body.

PHYSICS

Programme Specific Outcome (PSO)

1. Physics deals with wide variety of systems that is to be tested both theoretically and experimentally. The subject needs proper blending of both theory and experiment. Each theories needs to be tested experimentally and the varieties of experimental facts needs proper explanation from its theoretical viewpoint. Physics uses mathematics to organize and formulate experimental results. From those results new predictions can be made or a theory can be ruled out. Computational physics is playing a vital role in this regard. The students need proper understanding of the different aspects of physical theories and experimental techniques so that they can apply those techniques in the upcoming advanced courses when they have finished their UG 3 year syllabus.
2. Students are expected to acquire knowledge in physics, including the major disciplines of classical mechanics, quantum mechanics, electromagnetic theory, electronics, optics, special theory of relativity and modern physics. They must have a proper understanding of programming so that they can apply appropriate scientific programming skills wherever necessary.
3. Students should have the skill of identifying the key factors and applying appropriate principles and assumptions in the formulation of physical problems.
4. Students should learn how to design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes. Not only that they are expected to have an understanding of the analytical methods required to interpret and analyze results and draw conclusions as supported by their data.
5. Students will realize and develop an understanding of the impact of physics and science on society.
6. Students are also expected to develop written and oral communication skills in communicating physics-related topics.
7. Apply conceptual understanding of the physics to general real-world situations.
8. Discover physics concepts in other major disciplines such as mathematics, computer science, engineering, and chemistry.
9. After the completion of program, students will be able to have in-depth knowledge of basic concepts in physics.
10. Students will be able to apply the laws of physics in real life situations to solve the problems.

11. Student develop attitude of doing research through undertaking small projects.
12. Student will have set his foundation to pursue higher education in physics.
13. After completing the program student will have developed interdisciplinary approach and can pursue higher studies in subjects other than physics.

Course Outcomes (CO)

Course Title: Mathematical Physics (Semester I, III, IV)

- To have clear idea about limit, continuity convergence so that the idea can be applied to solve physical problems.
- To be able to solve various types of differential equations so that the idea can be applied to solve physical problems.
- To have clear concept of vectors and matrices so that the idea can be applied to solve physical problems.
- To have clear idea of Fourier series and integral transforms so that the idea can be applied to solve physical problems.
- To have idea about probability theory so that the idea can be applied to solve physical problems.
- To have idea about complex analysis so that the idea can be applied to solve physical problems.
- To have idea about variational principle so that the idea can be applied to solve physical problems.
- To be able to handle mathematical problems using python programming

Course Title: Mechanics (Semester I)

- To be able to analyze motion of single particle and system of particles
- To study physical problems using inertial and non-inertial frames
- To understand rigid body dynamics and be able to study complicated motion of rigid bodies
- To understand Fluid dynamics
- To be able to measure different elastic constants experimentally

Course Title: Waves and Optics (Semester II)

- To understand physical characteristics of simple harmonic, damped and forced oscillations.
- To be able to analyze the cases when various simple harmonic motions superpose
- To understand the mechanism of various wave propagations in nature.
- To understand Interference, Diffraction using wave theory of light.
- To be able to study Interference and Diffraction phenomena experimentally.

- To be able to handle different optical instruments such as telescopes, microscopes, interferometers, spectrometers

Course Title: Electricity and Magnetism (Semester II)

- To be able to solve various electrostatic problems applying Coulomb's law, Gauss's Law, Superposition principle.
- To understand nature and properties of dielectrics
- To be able to solve various magnetostatic problems applying Biot Savart's law, Ampere's circuital law
- To understand induction phenomena
- To develop skill of various problem solving.
- To be able to study electric circuits.

Course Title: Thermal Physics (Semester III)

- To understand the basic laws and formulations of Thermodynamics.
- To understand the concept of entropy and 2^{nd} law and to apply these ideas in real situations.
- To be able to apply Maxwell velocity distribution and equipartition of energy in varieties of situations.
- To understand the origin of gas pressure and conduction properties in terms of kinetic theory
- To understand behavior of real gases in nature.
- To be able to study various thermal properties of matter experimentally.

Course Title: Modern Physics (Semester III)

- To have idea on Black Body Radiation, Compton Effect, Photo electric effect
- To learn fundamentals of quantum mechanics and to be able to study dimensional motion problems
- To learn basic working principle of lasers
- To learn fundamentals of quantum mechanics and apply to one dimensional motion of particles
- To acquire knowledge about nuclear structure.
- To acquire knowledge about nuclear reactions.

Course Title: Scientific Writing (Semester III)

- To develop skill to write project reports, papers, articles, lab reports, CV, slides, books using Latex.

Course Title: Quantum Mechanics (Semester IV)

- To learn the mathematical tools needed to solve quantum mechanics problems.

- To be able to solve different problems such as Barrier problem, Linear Harmonic Oscillator problem, Hydrogen atom problem
- To obtain a detailed study of atom.
- To learn about the behavior of atoms in different excited states.
- To learn about different phenomena under the action of external electric and magnetic field.
- To learn about many electron atoms.

Course Title: Analog Electronics (Semester IV)

- To learn working principle of different electronic circuit and their application in real life.
- To have clear idea about properties and applications of zener diode, transistors, OPAMPs.
- To be able to construct regulated power supply, amplifier, oscillator, multi vibrator, temperature controller.

Course Title: Arduino (Semester IV)

- To have basic idea about Arduino
- To be able to write programmes

Course Title: Electromagnetic Theory (Semester V)

- To learn Maxwell's equations, gauge transformation, Poynting theorem etc and to be able to apply them to solve problems.
- To understand electromagnetic wave propagation.
- To learn Polarization phenomena of light using basic idea of electromagnetic theory.

Course Title: Statistical Mechanics (Semester V and VI)

- To understand how statistics of the microscopic world can be used to explain the thermal features of the macroscopic world.
- To learn both classical and quantum mechanical approach
- To learn both equilibrium and non-equilibrium statistical mechanics
- To be able to use thermal and statistical principles in a wide range of applications.
- To be able to apply MB, BE and FD statistics to solve problems
- To learn computer techniques to solve statistical problems.

Course Title: LASER and Non-linear Optics (Semester V)

- To be familiar with operation and construction of lasers.
- To learn about the properties of laser radiation, and how laser beams propagate through optical materials.
- To learn about practical properties of laser such as line broadening, line shape

- To have basic idea about Fiber Optics, Holography and non-linear optics

Course Title: Astro Physics (Semester V)

- To have the basic concepts in astronomy.
- To learn about the galaxy.
- To describe and understand the physical processes in the Sun and other stars.
- To have basic idea about cosmology.

Course Title: Solid State Physics (Semester VI)

- To be able to analyze the structural properties of elemental solids
- To be able to calculate electronic conductivity of solids
- To learn to evaluate thermal properties of solids using statistical approach
- To learn about super-conducting behavior of solids
- To learn about dielectric and magnetic properties of solids.

Course Title: Digital Electronics (Semester VI)

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To be able to design Digital Circuits.

Course Title: Nano materials and applications (Semester VI)

- To learn about the background on Nanoscience
- To learn about the synthesis and characterization of nano materials.
- To know about special properties of nano materials.
- To know about huge application of nano materials in technology.

POLITICAL SCIENCE

Program Specific Outcomes

1. This course in B.A. in Political Science enables the students to develop an overall understanding on political institutions, society, culture, politics and international relations. More specifically, it shall enable the students to evolve a critical understanding on Indian Politics and its nature and contemporary trends.
2. The exposure to Political Science also encourages them to develop a scientific outlook on above-stated subjects, as it emphasizes the role of empirical methods and theories in building up the knowledge over discipline.

3. It not only introduces the students to the structural and functional dimensions of political institutions but also a range of theories which equips them with a critical understanding on society and politics. For example, after studying the degree programme, the students shall be capable of providing political analysis on political parties, party system, and models of democracy.
4. The contemporary topics as included in the syllabus shall generate interest for research among the students in future.

Course Outcome

1. This program on Political theory aims to introduce certain key aspects of conceptual analysis in political theory and the skills required to engage in debates surrounding the application of the concepts. In today's inter-disciplinary world, this program equips students to take on in-depth analysis of concepts like rights, equality, justice, freedom which are emerging as ever-pertinent questions.
2. The program on International Relations will provide students with great insights on political affairs, public policies, economic trends, social issues, law and many more.As an international relations specialist a student will have a broad set of career options in addition to politics, including in fields like economics, social systems and the cultural life of communities. Students can either opt for higher education such as master's degree or prepare for various competitive examinations such as UPSC and other state governments. They can also act as a link between the country you represent and the country where they are stationed; collect and report on all the information that would affect nation's interests.
3. The program on Public Administration is a system through which the government carries out its business of ruling and controlling effectively.Public Administrators may choose careers in the government sector.It will prepare the students to work in many governmental and other management careers, including health care administration, human resources management and even city management. Students can either opt for higher education such as master's degree or prepare for various competitive examinations such as UPSC and other state governments.
4. The program on Comparative Government and Politics will enable the students to have the access to a broad range of career options and job opportunities. They can apply their knowledge and critical thinking skills in political analysis as well as public policy analysis.The students can find the jobs in various non-profit organizations, in the scientific and academic fields. The typical employers are: government, nonprofit organizations, research institutes or think-tanks, private companies including foreign corporations, educational institutions.
5. The program Indian Government and Politics enables the students to hone their skills in analysing the current political events in the country. It trains them to take up news

analysis and journalism as possible career prospects. It also allows them to take up a career in mass media - with mass communication and public relations.

PSYCHOLOGY

Program specific outcome

Part I:

PSO 1. Understanding the basic psychological process, nature, scope and branches of psychology, sensory processes and perception, difference between sensation and perception, gestalt theory of perception, attention, emotion.

PSO 2.Understanding the biological bases of behaviour including nervous system and endocrine glands.

PSO 3. Understanding developmental psychology, its methods for research, the relative importance of hereditary and environmental factors, and different phases of life span development.

PSO 4.Understanding educational psychology and the relation between psychology and education, nature and scope of educational psychology, learning and memory processes, forgetting and intelligence.

PSO 5. Understanding social psychology, attitude formation and change, social perception, person perception, conformity and compliance.

PSO 6. Understanding Industrial psychology, personnel selection, job motivation, job satisfaction, leadership style, work culture, work environment and human resource management.

PSO 7. Understanding psychopathology, criteria of normality, methods used in clinical psychology, causes and symptoms of abnormal behaviour and basic idea regarding counselling and psychotherapy.

PSO 8. Understanding adjustment, conflict, stress management.

PSO 9. Conducting experiments on psychological variables and administration of psychological tests.

PSO 10. Application of statistics in data analysis.

Course outcome:

CO1. Understanding basic psychological processes and biological basis of behaviour

CO 2. Understanding developmental and educational psychology

CO 3. Understanding social and industrial psychology.

CO 4. Understanding psychopathology and adjustment.

CO 5. Conducting experiments and psychological tests; use of statistics in data analysis.

Course outcome

Part I:

In module 1.1 students will learn the basic psychological process. It covers a wide range of topics: nature, scope and branches of psychology, sensory processes and perception, difference between sensation and perception, gestalt theory of perception, attention, emotion and biological bases of behaviour including nervous system and endocrine glands. Module 1.2 is all about Developmental psychology and educational psychology. In developmental psychology one learns the scope and methods used in developmental researches, the controversy regarding the relative importance of hereditary and environmental factors and different phases of life span development. In educational psychology students learn the relation of psychology with education, nature and scope of educational psychology, learning and memory processes, forgetting and its causes and intelligence.

Part II:

Part II has four modules (two is for theory and two is for practical). In the theory portion there is social psychology, industrial psychology, psychopathology and adjustment. In practical portion one learns to use statistical techniques for data analysis, conducting experiments on attention, learning, memory, administration of intelligence and personality assessment.

CBCS system

Semester 1: Foundation of psychology- here students learn the historical background of the subject, perspectives, methods, Indian context in studying psychology, cognitive processes, motivation, emotion, personality and intelligence. They have an experiment on memory and an Intelligence test in their practical syllabus.

Semester II: Introduction to social psychology- here students learn the historical background of the subject, scope, methods, approaches to understand social behaviour, attitude (formation and change) interpersonal processes, and group dynamics. Practical on group cohesiveness and group influence on behaviour are also included in the curriculum.

Semester III: Psychological disorders- The aim of studying this part is to develop an understanding of the development of psychological disorder, theoretical perspectives of psychological disorder, clinical features of various psychological disorders, and the treatment of those psychological disorder. Practical on anxiety and stress are also in the syllabus.

Semester IV: Statistical methods and psychological research- here the objective is to introduce basic statistical methods, psychological testing, qualitative methods and their uses. The topics covered are measurement procedures, graphical representation of data, data analysis, psychological testing and qualitative methods.

SANSKRIT

After successful completion of B.A. Honours in Sanskrit

PSO 1. Students will learn Sanskrit Language and communication skills in Sanskrit very efficiently. By learning a new language they will be able to compare its characteristics, grammatical foundation, enriched vocabulary etc. with other Indian languages especially with those who belong to OIA family of languages.

PSO 2. Through the Sanskrit language students will get connected to the ancient heritage of Indian subcontinent, its glorious culture and diversity, its history and its journey from past to present. The actual India with its splendid culture will be in front of the students devoid of any external misinterpretation because the students will be able to access the primary sources and will not depend on the secondary sources like translation or exposition in other languages.

PSO 3. Students will learn to read the ancient manuscripts and will get initial knowledge about Inscriptions, different ancient scripts and some other languages derived from Sanskrit like Pāli and Prākṛta etc. which will lead them to learn Ancient Indian History in a very authentic way. Students will be ready to serve in different projects related to Manuscripts and archives.

PSO 4. Students will know the base and basic ideas of Indian society and social Institutions and Indian Polity as well. Being aware about the evolution of Indian society with all its details they will be critical to the social rules and regulations and therefore they will be awakened citizens and will help to make a better Indian society. They will be able to bring forth the liberal ideas from Ancient Indian texts and to propound harmony in different aspects of society.

PSO 5. Students will enjoy Ancient and Modern Sanskrit literature and will be well-versed in Indian Poetics. Students will acquire good writing skill and will learnt the art of articulating different aspects and emotions of life following the literary creation of great poets (*kavi*) of all time like Kālidāsa, Bāṇa, Māgha and others.

PSO 6. The syllabus gives the students a great chance to literate themselves in computer and computational Sanskrit simultaneously. Students will learn digitizing of texts, data typing and printing, different software and machines (searching, translating, analyzing etc.) related to Sanskrit. They will get a chance to get employed in few of trending fields of ICT as well.

PSO 7. Students will be well aware about the trending ideas of Indology in both East and West, which will provide them the chance to choose future streams of research in both India and abroad. Because of the revolution in Information and technology field students will get the chance to stay in touch with the learned researchers and their research works and with the renowned institutions as well.

PSO 8. Students will get introduced to Indian Philosophical schools and will read a few texts on it. They will also know the differences and characteristics of Schools of Indian Poetics as well. After the completion of the course they will know their field of interest which will help them to choose future specializations in academic venture. Students will learn the Pāṇinian system of Sanskrit Grammar and will know the structure of any language very well and will be efficient enough to learn other languages than students of other streams.

PSO 9. Students will read the texts like Ramayana and Mahabharata which simultaneously will grow their interest in Indian Culture and literature and will develop their personality. Bhagavad Gīta, Nītiśataka and other nīti texts will help them to lead a healthy and balanced life which is the need of the hour.

PSO 10. Students will find themselves employable in academic fields, language teaching posts, administration through competitive examinations, different manuscript, translation and in other projects and also make them ready for further studies and research works in specific fields.

Course Outcome

CO 1. Core Courses of the Under Graduate Syllabus cover a wide range of subjects of Indology through Sanskrit Language and therefore provide a good opportunity to students to acquire diversified knowledge about Indian's rich ancient knowledge tradition encompassing literature, poetics, dramaturgy, ancient science, philosophy, grammar, smṛti (Social Institutions and Polity), Epigraphy and Paleography, mythology etc. Students will get introduced in all these fields and will read a few texts related to each field in a very scientific way.

CO 2. Through the Skill Enhancement courses (SEC) students acquire practical knowledge about Sanskrit language and its applicability in day to day life and in Information and Communication Technology as well. Students become well equipped both in theoretical and practical aspects of Sanskrit Language and the texts related to the language. These courses enhance the writing and conversation skills of the students to make them free from being dependent from secondary sources.

CO 3. Discipline Specific Courses (DSE) allow the students to dive deep into the theoretical parts of different fields of Indology like Philosophy, Poetics, Ancient and Modern Literature etc. These courses gradually improve the critical thought of the students and they will be expert in explanation and analysis of the ancient texts and will find applicability of them in current context.

CO 4. Students will read Vedic, classical and modern Sanskrit literature and therefore will get the chance to critically perceive the evolution pattern being guided by the research works done by great scholars of East and West for a long time. Students will read the literary creations of the renowned poets of all time like Kālidāsa, Bāṇa etc. and will be able to appreciate them and compare their works with others of past and present.

CO 5. Students will learn the Indian Social Institutions and Indian Polity from the Mahābhārata, Rāmayaṇa, Arthaśāstra, Manusaṃhitā etc. They will learn the ideas of people like MK Gandhi, Aurobindo, Vivekananda and other modern thinkers regarding them as well.

CO 6. Students will learn the discussions on Indian Dramaturgy which is very enriched and ahead of time. The lessons on the schools of Indian Poetics will grow a critical approach in the students while discussing and analyzing any literature form.

CO 7. Students will get introduced to the Indian Philosophical Schools both the Orthodox and non Orthodox and will read a few canonical texts related to the schools.

CO 8. The courses on Paleography and Epigraphy will educate the students in Ancient Manuscripts, Inscriptions and Scripts which will create an expertise in discussion of Ancient Indian History.

CO 9. Students will learn Pāṇinian Grammar following the authentic primary texts which will allow them to analyze the structure of Vedic and Classical Sanskrit Language. This structure will help a lot while creating translating software or while decoding the structure of any language.

CO 10. Students will learn a lot about Indian approach on ethics, yoga, science and other practical aspects following the ancient texts. Self management in Gīta is a very important addition to the syllabus which will teach the students to manage the balance in their personal life and lead to a very creative and fruitful social life simultaneously.

Course Outcomes (1+1+1 System)

Paper I:

1. Basic introduction to Sanskrit syntax, Morphological generation, and Semantics.
2. Textual analysis of Sanskrit prose literature and different composing styles (i.e. Kādambarī and Daśakumāracarita)
3. Textual and literary criticism of Kālidāsa's Abhijñānaśakuntala (act 1-3)
4. Basic introduction to Sanskrit Poetics with the help of Kāvyālaṅkārasūtravṛtti

Paper II:

1. Study of Sanskrit Metres (i.e. Chandomañjarī)
2. Textual and literary analysis of drama from pre-kālidāsa era (i.e. Svapnavāsavadatta)
3. Textual and literary criticism of Kālidāsa's Abhijñānaśakuntala (act 4-7)
4. Textual and literary analysis of Mahākāvya from post-kālidāsa era (i.e. Kirātārjunīya)

Paper III:

1. General Introduction of Indian Poetology(Poetological Text in Sanskrit: Sāhityadarpaṇa of Viśvanātha-Kavirāja; chapter 6-10)
2. Introduction and basics of Vedic, scientific and Technical Sanskrit Literature

Paper IV:

1. Essay in Sanskrit; on topics of Indic culture, idols, ideals, social values, current sensibility and the like.
2. Post-Kālidāsa Sanskrit Mahākāvya: Bhaṭṭikāvya (or Rāvaṇavadha) of Bhaṭṭi (Canto 2)
3. History of classical Sanskrit Literature including Inscriptional and Historical Works

Paper V:

1. Vedic texts and Vedic grammar (Vedic texts: Hymns of Ṛgveda — 1.1. Agnisūkta, 10.121. Hiraṇyagarbhasūkta, 10.125. Devīsūkta, 10.34. Akṣasūkta, 10.191. Saṃjñānasūkta)
2. Vedic Grammar: Padapāṭha and general outline of Vedic grammar.
3. Vedic texts; Yajurveda; Atharvaveda and Brāhmaṇa, Upaniṣad (Rudrādhyāya (Śukla-Yajurveda, 16.1-14), Atharvaveda (12.1.1-10), Maumatsyakathā (śatapathabrahmaṇam), śunaḥśepopakhyānam (Aitareyabrāhmaṇam, 3.3.3), Bṛhadāraṇyakopaniṣad (4.4. and 4.5.)

Paper VI:

1. Texts on Dharmaśāstra and Arthaśāstra
   a) Basic introduction to ancient Indian legal system
   b) Comparison with Modern Indian legal system (specially with Indian Penal Code) (Yājñavalkya-saṃhitā - Chapter 2 Vyavahārādhyāya)
   c) Different perspectives on ancient Indian polity (i.e. rājadharmaprakaraṇā of Manu and arthaśāstra of kauṭilya)
   d) History of Indian Dharmaśāstra, Arthaśāstra and Nītiśāstra

Paper VII:

1. Sanskrit Grammatical text : Siddhāntakaumudī of Bhaṭṭojidīkṣīta.

2. General Acquaintance with Phonetic Tendencies (The following topics — Assimilation, dissimilation, epenthesis, prosthesis, metathesis, anaptyxis, haplology, syncope, apocope, aphaeresis, cerebralisation, analogy).
3. Siddhāntakaumudī of Bhaṭṭojidīkṣita — Samāsaprakaraṇa; excluding Samāsāntavidhāna
4. Elementary knowledge about 'Science of Language', the IE family of language and the phonetic laws, history of the concept of IE language, divisions of IE. (Among phonetic laws the following are important — Grimm's law, Verner's law, Grassmann's law, Bartholomae's law, Collitz's law, Fortunatov's law)

Paper VIII:

1. General Acquaintance with the Indian philosophical systems.
2. Elementary knowledge about the subject of Annaṃbhaṭṭa's Tarkasaṃgraha.

SOCIOLOGY

PSO

After successfully completing B.A. in sociology Students will be able to explain sociological texts and positions accurately, to identify and apply sociological research methods consistently, to articulate and defend precise sociological positions.

1. Sociological Imagination

Students will be able to apply "sociological imagination" to analyzing current events, political, economic and cultural context.

- Describe how sociology differs from and is similar to other social sciences and give examples of these differences and similarities.
- Apply the sociological imagination and sociological concepts and principles to her/his own life. Participate actively in civic affairs.

2. Sociological Understanding:

The ability to demonstrate sociological understandings of phenomena, for example, how individual biographies are shaped by social structures, social institutions, cultural practices, and multiple axes of difference and/or inequality.

3.Critical Thinking:

The ability to demonstrate critical thinking through the ability to analyze and evaluate social, political, and/or cultural arguments.

- Apply critical thinking skills to sociological data and theory.
- Easily move from memorization to analysis and application to synthesis and evaluation.
- Identify underlying assumptions in particular methodological approaches to an issue.

4. Social Structure

To understand how social structure operates, such that the student will be able to:

- Demonstrate how global processes shape local social structures and the effects on individuals.
- Show how institutions interconnect in their effects on each other and on individuals.
- Demonstrate how social change factors, such as population, urbanization, or technology affect social structure and individuals.
- Describe how social structure varies across time and place and the effects of such variations.
- Demonstrate how social change affects social structure and individuals and show how structure is constantly in a process of becoming.

5.Social Theory:

The ability to demonstrate an understanding of, and the ability to use, several of the major classical and/or contemporary perspectives in social theory.

6.Creating Sociological Knowledge

Sociology uses sociological methods to systematically Creating Knowledge and also uses sociological methods to systematically investigate social phenomena. They organize and analyze empirical materials to develop findings that illuminate social processes and problems.

7.Social Problems

Sociology focuses on the ways in which problems come to be socially defined, understood, debated, and resolved. Students learn about the varied processes through which problems reflect underlying social conflicts.

8. Social Research Method

At the end of the course, students should be able to:

- understand the characteristics and issues that make science different from other ways of knowing.
- understand the historical antecedents of methodology as they relate to the social sciences today and also understand the links between theory and research.

STATISTICS

PROGRAME SPECIFIC OUTCOME

The students can understand that the subject statistics has wide application in different branch of science, arts and commerce. They can understand that there is no such a branch that the subject does not creep in.

1. Descriptive statistics which includes different representation of statistical data and analysis of Univariate quantitative data. This also includes Fitting of Binomial, Poisson and Normal distributions, analysis of Bivariate quantitative data (Correlation and Regression Analysis, Rank Correlation)
2. The students have their course on Analysis of Multivariate quantitative data. All these Courses help the students to do their research work in future study.
3. All the topics of statistics do help the students to do their research works in medical sciences, agricultural sciences, management sciences etc.

Course Specific Outcome

Undergraduate

The undergraduate course in Statistics under CBCS credit system has been semesterised in 2018. In each semester the **General Elective**have theoretical and practical papers.

Sem I

In Sem I there are mainly 3 units . The first unit consists of basic and introductory concept of Statistics and the introduction to different types of data and there different modes of representation. The second unit consists of the basic measures of descriptive statistics like different Measures of central Tendency, Measures of Dispersion and Measures of Moments. The third unit consists of descriptive measures based on bivariate data and specifically concepts on Linear regression and Method of Least Square. At the end of the topic the students will be able to understand the basic statistics and the basic concepts of descriptive statistics.

Sem II

In Sem II there are mainly 3 units. The first unit consists of basic introductory concept of Probability Theory. The second unit consists of the basic concepts of random variables (both Discrete and Continuous) and the distribution of random variables. The third unit consists of few common distribution of both Discrete and Continuous random variables with different useful properties and the basic concepts of Central Limit Theorem (CLT). At the end of the topic the students will be able to understand the basic concept of Probability, random variables and Few standard (Discrete and Continuous) distributions and central limit theorems.

Sem III

In Sem III there are mainly 3 units. The first unit consists of Population and Sample, different methods of Estimation and basic concept of Testing of Hypothesis. It also consists of three important distributions (Normal, Chi-Square, t and F) useful for statistical inference. The second unit consists of basic concepts and useful terminology used for Testing of hypothesis and different hypothesis testing based on random sample generated from Single Univariate and Two Independent Univariate Normal Distribution. The third unit consists of Analysis of Variance (ANOVA), both One Way and Two Way (with single observation per cell and more than one observation per cell). It also consists of Basic concepts and basic principles of Design of Experiment with analysis of Completely Randomized Design (CRD) and Randomized Block Design (RBD).At the end of the topic the students will be able to understand the basic concept of Probability, random variables and Few standard (Discrete and Continuous) distributions and central limit theorems.

Sem IV

In Sem IV there are mainly 3 units. The first unit consists of concepts of Population and sample and different methods of sample Survey (like Simple Random Sampling and Stratified Random Sampling) and useful theorems. The second unit consists of the basic concepts of Index Number and different measures of Index number and their uses and limitations. This unit also consists of the basic concept of Time Series and different models, measurements used in Time Series Analysis. The third unit consists of Demographic Methods like different measures of Birth, Death and reproduction with their uses and merits and demerits. This unit also consists of basic concepts and uses of Life Table in connection with Demographic Data. At the end of the topic the students will be able to understand and learn the various applications of statistics.

ZOOLOGY

Programme Specific Outcome

After successfully completing B.Sc. in Zoology:

1. The Zoological study will enable students to gain knowledge on the overall animal world their habit and habitat and the role in environment. This will inculcate them the importance of every surviving animal in the earth and necessity of their presence for the survival of the ecosystem.

2. The concept of Ecology will enable the students to have an idea about the various pollutions in the ecosystem that are disturbing the balance of the nature. The concept of sustainable

development teaches the students to learn the optimum uses of the non-renewable resources of the earth and to apply methodologies for the use of renewable resources in the survival of the mankind.

3. The study of Molecular Biology, Biochemistry, Immunology, Parasitology, and Developmental Biology will help the students to gain knowledge in the life processes and will provide them scope in researches.

4. Biotechnology will provide impetus to the students to the use of various technologies in the field of biology. The use of animals in the welfare of human society like Apiculture, Sericulture, Poultry, Lac-culture, etc., Researches in this field will provide different job-oriented courses which will be beneficial to the students.

5. Field Excursion conducted is very much beneficial to the students. The visit to National Park or Sanctuary or Biosphere Reserve help the students to learn the various conservation strategies, both in-situ as well as ex-situ, for animals and plants. This forest study will help students to understand the importance of forests and their resources. This study provides them the idea about the status of different animals on the ecosystem and also the need of conservation of the threatened or endangered species.

6. The study of animal dissections will benefit the students to have an idea of the internal anatomy of the animal which will provide them a sound knowledge about the internal environment of the living animals.

7. The study harmful microbes help the students to know about the mode of infection of those pathogens. Moreover the control measures and the prophylactic measures will give a clear idea about how to manage the diseases and to design new medicines in combating the infections caused by harmful microbes.

8. Taxonomical studies enable the students to learn about the different variety and variability of the animal world. Taxonomy helps them to identify unknown specimens and also to group animals in a systematic way by way of phenotypic or genotypic or behavioural characteristics. This study is particularly important to the students in understanding the overall diversity.

9. The study of various ecosystems including marine, forest, aquatic, wetland etc., provide good idea to the students about the variety of ecosystems and their difference and interrelationships. The study also provide an idea about the floral and faunal communities of those ecosystems and give an idea about the native species of respective ecosystems.

Zoology Course outcomes (CBCS System)

Non-Chordates and Chordates: SEM 1-CC1 and GE 1, SEM 2-CC3 and GE 2, SEM 3-CC 5, SEM 4-CC 8

Upon successful completion of this coursestudents will be able to appreciate the diversity of life and develop a critical understanding how animals changed from a primitive cell to a collection of cells to a complex body plan. The project assignments will also offer them an essence of research to find the process involved in studying biodiversity and taxonomy.

Molecular Biology and Biotechnology: SEM 1-CC 2, SEM V-DSE A 1 and A2

Upon successful completion of this course students should develop a thorough grasp over the concepts, and relevance of molecular biology in the present day world. They should get well versed in recombinant DNA technology which holds immense application in the field of biomedical science, genomics, agriculture, environment management, etc. Therefore, a fundamental understanding of Molecular Biology will help in career opportunities in all these fields. They should also get research ideas in areas such as therapeutic strategies or related opportunities in industry.

Cell Biology: SEM 2- CC4

Upon successful completion of this course, students should acquire the detailed knowledge of different pathways related to cellular functioning in healthy and diseased states, cell signaling and apoptosis which will enable them to understand the pathology of tumor genesis and cancer. They should also be able to give a 'health forecast' by analyzing the genetic database and cell information. They should also get new avenues of joining research in areas such as genetic engineering, cloning, development of vaccine, transplant of organs etc.

Animal Physiology: SEM 3- CC 6, GE 3, SEM 4- CC9

Upon successful completion of this courses, the students should be able to develop an understanding on the development and function of vertebrate tissue, organ and organ system. They should also know understanding abnormal physiological changes in animal and human diseases and new methods for treating those diseases. They may also undertake research in any aspect of animal physiology in future.

Biochemistry: SEM 3- CC7

Upon successful completion of this course, the students will be able to understand the structure and biological significance of carbohydrates, proteins, lipids, enzymes and nucleic acids.

It will prepare them for making clinical diagnosis, understanding pathology of diseases, treatment of diseases, designing of drugs and understanding their metabolism and manufacture of various biological products like amino acids, proteins, antibiotics, hormones, enzymes, nutrients, etc. The composition of food materials including the quality-milk and possible adulterations can be checked by biochemical tests. This discipline will provide career opportunities in farming, fishery, poultry, sericulture, bee keeping and in environmental remediation.

SEC A: APICULTURE, SEM -3

Upon successful completion of this course, the student will understand the prerequisite to beekeeping, be able to identify where to purchase equipment and demonstrate how to assemble it and may set up a cottage industry. They also acquire detailed knowledge about the nutritional and medicinal importance of honey and economic importance of other bee products.

Immunology, CC10- SEM 4

Upon successful completion of this course Upon successful completion students will be able to understand the difference between the innate versus adaptive immune systems; and humoral versus cell-mediated immune responses; be able to distinguish various cell types involved in immune responses and associated functions; be able to distinguish and characterize antibody isotypes, development, and functions; understand the role of cytokines in immunity and immune cell activation; and be able to identify and characterize cytokines of particular immune importance; understand the significance the Major Histocompatibility Complex in terms of immune response and transplantation. They will be able to take up research careers in biomedical research, healthcare, agriculture and environmental monitoring.

SEC B: Aquarium Fisheries

Upon successful completion of this course, the students will develop awareness about the vast potentials involved in ornamental fish farming and trading. They will learn the scientific method of setting an aquarium, culture breeding and marketing techniques of common indigenous ornamental fishes besides learning the diseases in fishes and other constraints in their culture.

Ecology CC 11-SEM 5

Upon successful completion of this course students should understand the need to study animal ecology. They will be able to engage in field-based research activities to understand the theoretical aspects taught besides learning techniques for gathering data in the field. They will also be able to analyze a biological problem, derive testable hypotheses and then design experiments and put the tests into practice. They will also develop the ability to solve the environmental problems involving interaction of humans and natural systems at local or global level.

Genetics CC12- SEM 5, GE4-SEM 4

Upon successful completion of this coursestudents will be able to understand thebasic organization of prokaryotic and eukaryotic genome and perform genetic analysis at the gene, genome and population levels, understand gene expression and gene regulation mechanisms and be able to solve genetic problems. It also helps students to learn the molecular aspects of genetic disorders and mutations.

Parasitology DSE A1, SEM 5

Upon successful completion of this course, the students will be able to describe the mechanisms for transmission, virulence and pathogenicity of parasites, diagnose the causative agents, describe pathogenesis and treatment for important diseases like malaria, leishmaniasis, trypanosomiasis, toxoplasmosis, schistosomiasis,cysticercosis, filariasisetc, assess the importance of incidence, prevalence and epidemiology in parasitic infection.

Endocrinology DSE B1, SEM 5

Upon successful completion of this coursethe right kind detailed knowledge of the human body, especially the endocrine system. They should also be well qualified about the knowledge of all the prevailing hormonal disorders and their symptoms. It will imbibe career opportunities as pathologists, clinicians and allied medical fields.

Developmental Biology CC 13 SEM 6

Upon successful completion of this course, students will be able to understand that how a complete organism develops from a single cell, very similar mechanisms are used in very diverse organisms; and development is controlled through molecular changes resulting in variation in the expression and function of gene networks. They will also be able to examine the evolutionary history of the taxa based on developmental affinities and understand the relevance of developmental biology in medicine and its role in development of diseases.

Evolutionary biology CC14 SEM 6

Upon successful completion of this coursea student should be able to understand and explain the forces behind evolution (mutation, migration, natural selection, sexual selection, genetic drift) and the interaction among them, both over ecological and evolutionary time. They should also be able to generate evolutionary hypotheses for a wide variety of biological phenomena, read and understand research literature dealing with evolutionary biology and apply the evolutionary principles in their own research

Animal Behaviour and Chronobiology DSE B 2, SEM 6

Upon successful completion of this courses, the students will be able to develop a wide range of theoretical and practical techniques used to study animal behaviour. They will also be able to understand and evaluate the role of behavior of all animals, including humans, in the complex ecological world and use it in the protection and conservation of animals in the wild.

TEACHER EDUCATION

Programme Specific Outcomes:

The B.Ed. curriculum 2015 in the light of the stipulations of the NCTE Regulations 2014 has been organised in three broad categories namely:

1. Perspectives in Education
2. Curriculum and Pedagogic Studies and
3. Engagement with the Field

Perspectives in Education

To imbibe knowledge and develop an understanding of:

- the growth and development of the child and adolescents
- contemporary India and Education
- issues of diversity, inequality and marginalisation in Indian education
- theoretical foundations of knowledge and curriculum
- learning and teaching
- gender in the context of school and society
- creating an inclusive school

Curriculum and Pedagogic Studies

1. To develop competencies for organizing various instructional and student support activities: various methods and approaches of organizing learning experiences of secondary school students.
2. To develop skills required in selecting and organizing learning experiences.
3. To develop skills involved in dealing with the academic and personal problems of learners.
4. To acquire knowledge and develop an understanding of the various procedures and techniques of evaluation and theirclassroom applications.
5. To develop skills involved in selecting, developing and using evaluation tools.
6. To acquire knowledge and develop an understanding of various aspects of school management and activities

Engagement in the Field/ Practicum

1. To provide sustained engagement with the
    - Self
    - Child
    - Community
    - School

2. To establish close connections between different curricular areas.
3. To connect theoretical curricular areas with practicum through assignments and field work.
4. To provide a reflective school experience through a 20 week internship programme.
5. To enhance the professional capacities of the student-teachers through EPC courses.

Course Outcomes

Perspectives in Education:

Course-I (1.1.1): Childhood and Growing Up
1st Half - Development and its Characteristics
Objectives
The student teachers will be able to:-
1. Explain the concept of growth and development and stages of development with special reference to the stage of adolescence.
2. Rememberabout the developmental characteristics
3. Analyse the influence of heredity, environment including socio-cultural factors on developmental process
4. Develop the skills of applying the principles of development in improving the teaching learning process.

2nd Half - Aspects of Development
Objectives
The student teachers will be able to:-
1. Know about various aspects related to development.
2. Be acquainted with theories, types and factors of motivation, attention and interest.
3. Understand the nature of intelligence and know various theories related to it.
4. Develop skills for identifying and nurturing creativity.

Course-II (1.1.2): Contemporary India and Education
1st Half - Education in Post-Independent India
Objectives
The student teachers will be able to:-
1. Comprehend the various constitutional provisions
2. Compare the recommendations of various commissions and the National Policies of Education.
3. Examine the problems and solutions of elementary and secondary education and find out probable solution.
4. Acquire the skill to eradicate inequality, discrimination and marginalization in education.
5. Develop an idea about National Values.

2nd Half - Policy Framework for Education in India

Objectives

The student Teachers will be able to:-

1. Realize the policy framework for Education in India
2. Identify the contemporary issues in education
2. Develop the knowledge about various policies on education
3.Evaluate the role and functions of different monitoring agencies of education
4. Infer the role of community participation and development in education
5. Acquire skill to develop educational planning and management.

Course-III (1.2.3): Learning and Teaching

1st Half - Learning

Objectives

The student teachers will be able to:-

1. Comprehend the range of cognitive capacities among learners.
2. Reflect on their own implicit understanding of the nature and kinds of learning.
3. Compare and contrast different theoretical perspectives on learning
4. Demonstrate his/her understanding of different skills at different phases of instruction.

2nd Half - Teaching for Learning

Objectives

The student teachers will be able to:-

1. Define the process of teaching.
2. Identify and efficiently used different models of teaching.
3. Engage in teaching with proper approach.
4. Develop skills required for teaching.

Course-VIII-(A) (1.2.8A) Knowledge and Curriculum- Part-I

Objectives

The student teachers will be able to:-

1. Introduce themselves to perspectives in education focusing on epistemological, philosophical and sociological bases of education.
2. Distinguish between knowledge and skill, teaching and training, knowledge and information and reason and belief.
3. Understand education in relation to constitutional goal, social issues and modern values.
4. Explain the concept, scope and objectives of education.
5. Realize the concepts of curriculum and syllabi.
6. Design curriculum in the context school experiences, evaluation, power, ideology, process and practice & its transactional modes.

Course-VI (1.4.6) Gender, School and Society

Objectives

The student teachers will be able to:-

1. Develop gender sensitivity among the student teachers.
2. Discuss the gender issues faced by the schools.
3. Evaluate the paradigm shift with reference to gender studies.
4. Explain how gender, power and sexuality relate toeducation (in terms of access, curriculum and pedagogy).

Course-VIII (B) (1.4.8B) Knowledge and Curriculum- Part-II

Objectives

The student teachers will be able to:-

1. Compare the concepts of curriculum and syllabi.
2. Discover the relationship between power, ideology and curriculum.
3. Design curriculum in the context of school experiences, evaluation, power, ideology, process and practice & its transactional modes.

Course-X (1.4.10) Creating an Inclusive School

Objectives

The student teachers will be able to:-

1. Sensitize to the concept of inclusive education and social inclusion.
2. Familiarize with the legal and policy perspectives behind inclusion in education.
3. Describe the types, probable causes, preventive measures and characteristics of different types of disability.
4. Differentiate between street children, platform children, and orphans, children born and brought up in correctional homes, child labour and other socioeconomically backward children.
5. Analyse how inclusion can be practiced in mainstream class.

Pedagogy and Curriculum Studies:

Course-IV(1.1.4) Language across the Curriculum

Objectives

The student teachers will be able to:-

1. Recognize nature, function and role of language across the curriculum.
2. Acquaint with obstacles in language usage while using the language and ways to overcome them.
3. Understand the importance and use of first and second language, multilingualism and impact of culture.

4. Acquire knowledge about the communication process and verbal and nonverbal communication skills.
5. Familiarize the students with barriers to (Listening, Speaking, Reading, Writing) LSRW skills and activities for developing these skills.

Course-V (1.1.5) Understanding Discipline and Subjects

Objectives

The student teachers will be able to:-

1. Remember the basis of knowledge and branches of emerging knowledge.
2. Examine the emergence of various disciplines.
3. Develop among the teacher trainees, an understanding of science as a discipline
4. Understand the nature of Mathematics as a discipline.
5. Develop among the teacher trainees an understanding of language as a discipline.
6. Develop among the teacher trainees an understanding of social science as a discipline.

Course-VII-(A) (1.2.7A) Pedagogy of a School Subject Part-I

Pedagogy of Language Teaching (Bengali, English,)

Objectives

The student teachers will be able to:-

1. Merit effective and constructive acquaintance with the basic foundations of Language teaching in India and West Bengal.
2. Acquire practical expertise in pedagogical analysis and develop behavioural competencies in teaching skills.
3. Apply principles abstracted from the study of various methods and approaches as regards purpose and procedure of planning lesson.
4. Work out and practice strategies for teaching language skills and communication skills.
5. Credit working acquaintance with concepts of language learning assessment.
6. Turn in to resourceful user of different kinds of Language Test.
7. Become efficient in construction of Test and Test Items.
8. Explore and experience various resources for target language learning.
9. Try out various means of organizing various resources for target Language Learning.

Pedagogy of Social Science Teaching (History, Geography, Philosophy,)

Objectives

The student teachers will be able to:-

1. Appreciate the significance of teaching Social Science.
2. Remember different branches of Social Science and correlation among those.
3. Explain and compare the approaches & Methods of Teaching Social Science.
4. Apply the knowledge and skills in teaching Social Science.

5. Analysevarious practical aspects of Social Science.
6. Construct different Test Items.

Pedagogy of Science Teaching (Life Science)

Objectives

The student teachers will be able to:-

1. Appreciate the significance of teaching Science.
2. Discuss the Approaches & Methods of Teaching Science.
3. Apply differentscientific knowledge and skills.
4. Develop the demonstration skill for laboratory based practical.
5. Describe different laboratory based practical works in Science.

Course-IX(1.2.9) Assessment for Learning

1st Half - Assessment of the Learning Process

Objectives

The student teachers will be able to:-

1. Discuss the assessment for learning.
2. Define the process of evaluation and it uses.
3. Write educational objectives following Revised Bloom's Taxonomy.
4. Compare different techniques of evaluation, tools of evaluation and their uses.
5. Explain different characteristics of instruments of evaluation.
6. Identify different types of teacher made tests and will construct them.
7. Compute simple statistics to assess the learning.

2nd Half - Assessment of the Learning System

Objectives

The student teachers will be able to:-

1. Recognize different aspects of the complexities of the learning system.
2. Compare various school records designed for specific purposes.
3. Establish the relationship between school and the community.
4. Remember the physical, infrastructural and human resources available in the schools.
5. Understand the curricular process in the school.
6. Evaluate the school effectiveness and other functional aspects of the schools.
7. Explore the students support services available and achievements of the schools.

Course-VII-(B) (1.3.7B) Pedagogy of a School Subject Part-II

Pedagogy of Language Teaching (English, Bengali):

Objectives

The student teachers will be able to:-

1. Design appropriate teaching – learning strategy/approach suited to particular content.
2. Be at home with the principles of constructing content analysis of school curriculum.
3. Use ICT and various teaching aids in teaching of Languages.
4. Understand the historical development of Language Teaching.
5. Develop various skills related to language learning.
6. Prepare a blueprint before entering into a class.

Pedagogy of Social Science Teaching (History, Geography, Philosophy):
Objectives
The student teachers will be able to:-
1. Remember the steps in doing Pedagogical Analysis of Content.
2. Provide the students authentic historical knowledge with the proposed content & make them to be competent to do pedagogical analysis of the subject.
3. Examine critically the major concept, ideas, principles & values relating the subject concerned.
4. Compare various Methods and skills in teaching Social Science.
5. Develop the skills to prepare teaching-learning materials.
6. Evaluate different assessment procedures in Social Science.

Pedagogy of Science Teaching (Life Science):
Objectives
The student teachers will be able to:-
1. Be aware of teaching & learning of Science subject concerned.
2. Examine critically the major concept, ideas, principles & values relating to the subject concerned.
3. Develop the skills to prepare teaching-learning materials.
4. Make them competent to do the pedagogical analysis of the subject concerned.
5. Organize laboratory based practical in Science subject in particular.

EPC Papers:

Course EPC –1 (1.1EPC1) Reading and Reflecting on Texts
Objectives
The student teachers will be able to:-
1. Remember the meaning, process, importance and characteristics of reading.
2. Appreciate and apply different levels, types, techniques and methods of reading.
3. Acquaint with the skills of reading different types of texts.
4. Develop different types of reading skills through various activities and met cognition.
5. Learn the skills of reading comprehension and to enhance vocabulary.
6. Acquaint with the problems of reading across curriculum.

CourseEPC-2 (1.2EPC2) Drama and Arts in Education

Objectives

The student teachers will be able to:-

1. Understand the use of 'Drama' as Pedagogy.
2. Use 'Role play' technique in the teaching learning process.
3. Discuss the importance of dramatic way of presentation.
4. Integrate singing method in teaching learning process.
5. Analyse various 'Dance forms' and their integration in educational practices.
6. Use art of drawing and painting in teaching learning process.
7. Develop creativity through different creative art forms.
8. Explain the efficacy of different art forms in education.

CourseEPC-3 (1.4EPC3) Critical Understanding of ICT

Objectives

The student teachers will be able to:-

1. Understand the social, economic, security and ethical issues associated with the use of ICT.
2. Identify the policy concerns for ICT.
3. Describe a computer system;
4. Operate the Windows and/or Linux operating systems.
5. Use Word processing, Spread sheets and Presentation software.
6. Acquire the skill of maintaining the computer system and the skill of trouble shooting with the help of Anti-Virus and Other tools.
7. Operate on Internet with safety.
8. Elucidate the application of ICT for Teaching Learning.
9. Develop various skills to use computer technology for sharing the information and ideas through the Blogs and Chatting groups.

CourseEPC-4 (1.4EPC4) Understanding the Self

Objectives

The student teachers will be able to:-

1. Define the meaning and importance of self-concept and self esteem.
2. Explain different factors related to self-concepts and self-esteem.
3. Describe the concept and importance of yoga and well-being.
4. Be sensitized about the concepts and interrelationships of interpersonal intelligence, personality development and emotional intelligence
5. Develop their personality through various practices likeMeditation ,Yoga etc.

Optional Papers:

Course-XI (1.4.11) Optional Health and Physical Education

Objectives

The student teachers will be able to:-

1. Build a scenario of Health Education in India.
2. Develop a Knowledge Base of the Most Common and Uncommon Diseases in India, their Diagnosis & Remediation
3. Discuss the Tech Related Health Risks & Learn How to Fix These.
4. Study the Health Education Vision & Mission of India.
5. Practice healthy habits.

Course-XI (1.4.11) Optional Peace & Value Education

Objectives

The student teachers will be able to:-

1. Define the meaning and role of peace education and value education in present context.
2. Identify the components of peace and value education.
3. Explain different perspectives of peace and value education.
4. Discuss the methods and evaluation of value education.
5. Organize/Participate in various value based activities.

Course-XI (1.4.11) Optional Guidance and Counseling

Objectives

The student teachers will be able to:-

1. Discuss guidance and counseling in details.
2. Define mental health.
3. Develop the knowledge about adjustment and maladjustment.
4. Acquire skill to develop tools and techniques.
5. Analyse the Abnormal Behaviour and Mental illness.

Course-XI (1.4.11) Optional Environmental & Population Education

Objectives

The student teachers will be able to:-

1. Explain the concept of population and environmentalEducation.
2. Discuss the objectives, scope and methods of teaching environmental andpopulation education.
3. Nurture environmental attitudes and values within one-self.
3. Analyse the population and environmental education policies, the process of urbanization and migration.
4. Judge the importance of sustainable development and Agenda 21.
5. Evaluate the various issues related topopulation and environmental education.