

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Fundamentals of Chemistry – I (CHEM-H-CC1-1)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Extra nuclear structure of atoms Wave-Particle duality; de Broglie hypothesis. Heisenberg's uncertainty principle. Introducing Schrödinger equation. Hydrogen and hydrogen like systems (detailed solution not required) .Concept of Atomic Orbital; shapes of s, p and d orbitals. Radial and angular distribution curves. Extension to multielectronic systems. Aufbau principle and its limitations; Pauli's exclusion principle.	1.Lee,J.D.Concise Inorganic Chemistry 2. Atkins, Overton, Rourke , Weller , Armstrong; Shriver & Atkins' Inorganic Chemistry, 5th Ed., Oxford University Press (2010). 3.Huheey,J.E.;Keiter,E.A,& Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity	8	Chalk and Talk	(SB)
	Periodicity Hund's rules and multiplicity. Effective nuclear charge. Shielding and penetration; Slater's rule. The general idea about modern periodic table, atomic and ionic radii, ionization energy, electron affinity and electronegativity –definition, trends of variation in periodic table and their application in explaining and predicting the chemical behavior of elements and compounds. Electronegativity scales (Pauling's, Mulliken's and Allred-Rochow's scales). Inert pair effect.		7	Chalk and Talk	(SB)
Module : II	Basics of Organic Chemistry Bonding and Physical Properties Valence Bond Theory: Nomenclature of Organic Compounds, Concept of hybridisation, shapes and structures of molecules, double bond equivalent (DBE), Resonance (including hyperconjugation) and Resonance energy.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003.	2	Chalk and Talk	(PR)
	Electronic displacement: Inductive effect, bond polarization and bond polarizability; steric effect, steric inhibition of resonance.		2	Chalk and Talk	(PR)

Subject Name/Code: Chemistry Major / CHEM-H

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Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	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-,5-7 membered ring systems); Hückel's rules for aromaticity up to [8] annulene; concept of antiaromaticity; non-aromatic molecules.		4	Chalk and Talk	(PR)
	Physical properties Melting point/boiling point and solubility of common organic compounds in terms of covalent & non-covalent intermolecular forces; polarity of molecules and dipole moments.		2	Chalk and Talk	(PR)
	Stereochemistry – I: Bonding geometries of carbon compounds and representation of molecules: tetrahedral nature of carbon and concept of asymmetry; Fischer, sawhorse, flying wedge and Newman projection formulae and their inter translations. Concept of chirality and symmetry: symmetry elements, molecular chirality and centre of chirality; asymmetric and dissymmetric molecules; enantiomers and diastereomers; concept of stereogenicity, chiral centres and number of stereoisomers: systems involving 1/2-chiral centre(s).	1. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd , 2020	5	Chalk and Talk	(PR)

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Paper Name & Code: Fundamentals of Chemistry – I (CHEM-H-CC1-1)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Thermodynamics -I : Concept of systems (open, closed and isolated) and surroundings. State of a system; Intensive and extensive variables. Partial derivatives. Exact and inexact differentials. Path function and State function. Concept of heat and work. Zeroth law of thermodynamics. Concept of thermodynamic reversibility. Concept of internal energy and 1st law of thermodynamics. Enthalpy and heat capacity, Relations between C_p and C_v . Isothermal and Adiabatic processes ; Calculations of ΔU , ΔH , q and w involving ideal gases in different processes. Enthalpy of reaction. Hess's law. Enthalpy of formation and combustion. Kirchhoff's equation.	1. Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011 2. Castellan, G. W. Physical Chemistry, Narosa , 2004	9	Chalk and Talk	(IS)
	Chemical Kinetics-I: Concept of order and molecularity. Rate laws for zero, 1st and 2nd order reactions and in general for any n-th order reaction. Determination of order of a reaction by half-life and differential methods. Rate determining step and steady state approximation. Opposing, Consecutive and parallel reactions (first order steps only). Temperature dependence of rate constant and Arrhenius equation.	3. Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	6	Chalk and Talk	(IS)
		Total	45		

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Paper Name & Code: Fundamentals of Chemistry – I (CHEM-H-CC1-1)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	(1) Calibration and use of apparatus. (2) Preparation of primary standard solutions (Oxalic Acid and $K_2Cr_2O_7$)	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	6	Chalk and Talk and Hand on Demonstration	(SG)
	Acid-Base Titrations: (3) Standardization of NaOH standard oxalic acid solution. (4) Estimation of carbonate and bicarbonate present together in a mixture (5) Estimation of acetic acid in commercial Vinegar.		8		(SG)
	Oxidation-Reduction Titrimetry: (6) Standardization of $KMnO_4$ standard oxalic acid solution. (7) Estimation of Fe(II) using standardized $KMnO_4$ solution. (8) Estimation of Fe(III) using standard $K_2Cr_2O_7$ solution. (9) Estimation of Fe(II) and Fe(III) in a given mixture using standard $K_2Cr_2O_7$ solution.		12		(SG)
	Practice		4		(SG)
		Total	30		

LESSON PLAN: Semester-3 (CCF)

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: CHEM-H-CC3-3

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module: I Thermodynamics -II	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 $\delta Q/T$ 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; Temperature – Entropy diagram. Useful work and The Gibbs and Helmholtz function. Changes at constant T, P. Application to electric work. Criteria for spontaneity and equilibrium. Gibbs-Helmholtz equation, The Gibbs Function and useful work in Biological systems. Gibbs free energy and spontaneous phase transition. Maxwell's relations; Joule-Thomson experiment and its consequences; inversion temperature; Joule-Thomson	Castellan, G. W. <i>Physical Chemistry</i> , Narosa	15	On class demonstrations using chalk and board, interactive discussions	IS

LESSON PLAN: Semester-3 (CCF)

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Name of Faculty: Dr Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: CHEM-H-CC3-3

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	coefficient for a van der Waals gas; General heat capacity relations				
	Systems of Variable Compositions: State functions for system of variable compositions. Criteria of equilibrium and spontaneity in systems of variable composition. Partial molar quantities, dependence of thermodynamic parameters on composition; Chemical potential as an escaping tendency. Gibbs-Duhem equation, Entropy and Gibbs function for mixing of ideal gases, the chemical potential of ideal mixtures. The Fugacity function of a pure real gas. Calculation of the fugacity of a van der Waals gas using compressibility factor. Definitions of Activities and activity coefficients. Choice of standard states.	Kapoor K.L, A Text Book Of Physical Chemistry, McGraw Hill India	5	On class demonstrations using chalk and board, interactive discussions	IS
Module: II Applications of Thermodynamics – I	Chemical Equilibrium: Thermodynamic conditions for equilibrium, degree of advancement; van't Hoff's reaction isotherm (deduction from chemical potential); Variation of free energy with	Denbigh, K. <i>The Principles of Chemical Equilibrium</i> , Cambridge	6	On class demonstrations using chalk and board, interactive discussions	IS

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Paper Name & Code: CHEM-H-CC3-3

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	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.				
Module: III ELECTROCHEMISTRY-I (i) Conductance	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	Castellan, G. W. <i>Physical Chemistry</i> , Narosa Glasstone, S. & Lewis, G.N. <i>Elements of Physical Chemistry</i>	9	On class demonstrations , study material supplied, modelling and interactive discussions	AS

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Paper Name & Code: CHEM-H-CC3-3

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	(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				
(ii) Ionic equilibrium	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	Atkins, P. W. & Paula, J. de <i>Atkins' Physical Chemistry</i> , 10th Edition, Oxford University Press	8	On class demonstrations, study material supplied, modelling and interactive discussions	AS

LESSON PLAN: Semester-3 (CCF)

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: CHEM-H-CC3-3

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	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				
CHEM-MD-CC5-4-P	Experiment 1: Determination of rate constant of the reaction between H ₂ O ₂ and acidified KI solution using Clock reaction. Experiment 2: Determination of the rate constant for the decomposition of H ₂ O ₂ using FeCl ₃ as catalyst. Experiment 3: Determination of the rate constant for the first order acid catalyzed hydrolysis of an ester.	<i>Practical Workbook Chemistry (Honours), UGBS, Chemistry, University of Calcutta, 2015</i>	30	On class explanation, experimental practice in laboratory	AS+IS

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Department Name: Chemistry

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Paper Name & Code: CHEM-H-CC3-3

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Experiment 4: To study the kinetics of the inversion of cane sugar using a polarimeter				
		TOTAL	45(TH)+30 (PR)=75		

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Fundamentals of Chemistry – I (CHEM-H-CC4-3)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Aromatic Substitution: Electrophilic aromatic substitution Mechanisms and evidences in favour of it including PKIE; orientation and reactivity; reactions: nitration, nitrosation, sulfonation, halogenation, Friedel-Crafts reaction; one-carbon electrophiles (reactions: chloromethylation, Houben-Hoesch, Vilsmeier-Haack, Reimer-Tiemann, Kolbe-Schmidt); <i>Ips</i>o substitution. Nucleophilic aromatic substitution Addition-elimination mechanism and evidences in favour of it; SN1 mechanism; <i>cine</i> substitution (benzyne mechanism), structure of benzyne. Birch Reduction of benzenoid aromatics Benzene, Alkylbenzene, Anisole, Benzoic acid (with mechanism). General Treatment of Reaction Mechanism – II Concept of organic acids and bases Concept of pK_a and pK_aH, effect of structure, substituent and solvent on acidity and basicity; proton sponge. Tautomerism Basic difference between tautomerism and resonance, prototropy (keto-enol, phenol-keto); 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, basic ideas about valence tautomerism and ring-chain tautomerism.	1. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 2. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	20	Chalk and Talk	(PR)

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Fundamentals of Chemistry – I (CHEM-H-CC4-3)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : II	Stereochemistry –III Conformation-I Basic idea of conformation. Conformational Nomenclature (Newman & Sawhorse): eclipsed, staggered, gauche, syn and anti; Special reference to preferred geometry for β -elimination. Relative stability of conformers on the basis of steric effect: butane-gauche interaction. Substitution and Elimination Reactions: Nucleophilic substitution reactions Substitution at sp^3 centre [systems: alkyl halides, allyl halides, benzyl halides, alcohols, ethers, epoxides, α -halocarbonyls]: mechanisms (with evidence), relative rates & stereochemical features: SN_1 , SN_2 , SN_2' , SN_1' (allylic rearrangement) and SN_i ; effects of solvent, substrate structure, leaving group and nucleophiles (including ambident nucleophiles, cyanide & nitrite); substitutions involving NGP (with heteroatoms and phenyl groups). Elimination reactions E_1 , E_2 , E_1cB and E_i (pyrolytic <i>syn</i> eliminations); formation of alkenes and alkynes; mechanisms (with evidence), reactivity, regioselectivity (Saytzeff/Hofmann) and stereoselectivity; comparison between substitution and elimination reactions, comparison between nucleophilicity and basicity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition, Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 4. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	13	Chalk and Talk	(PR)

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Fundamentals of Chemistry – I (CHEM-H-CC4-3)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Chemistry of alkenes and alkynes 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, <i>syn</i> and <i>anti</i> -hydroxylation, ozonolysis, addition of singlet and triplet carbenes; Simmons-Smith cyclopropanation reaction; electrophilic addition to 1,3-butadiene; concept of kinetic and thermodynamic control of products; radical addition: HBr addition; mechanism of allylic and benzylic bromination in competition with brominations across C=C; use of NBS; interconversion of <i>E</i> and <i>Z</i> alkenes. Addition to C≡C (in comparison to C=C) Mechanism, reactivity, regioselectivity (Markownikoff and anti-Markownikoff addition) and stereoselectivity; reactions: hydrogenation, Hg (II) ion catalysed hydration, hydroboration-oxidation, dissolving metal reduction of alkynes (Birch); reactions of terminal alkynes by exploring its acidity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition, Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 4. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	12	Chalk and Talk	(PR)
		Total	45		
Practical	Identification of Pure Single organic Compound. Solid compounds Oxalic acid, tartaric acid, citric acid, succinic acid, resorcinol, urea, glucose, cane sugar, benzoic acid and salicylic acid Liquid Compounds: Formic acid, acetic acid, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde and nitrobenzene	1. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical Organic Chemistry, 5th Edition, Pearson India, 2003 2. Practical Workbook Chemistry (Honours), UGBOS,	26	Chalk and Talk and Hand on Demonstration	(PR)

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Fundamentals of Chemistry – I (CHEM-H-CC4-3)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Practice	Chemistry, University of Calcutta, 2015	4		
		Total	30		

LESSON PLAN: Semester- (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: ORGANIC CHEMISTRY – III (CHEM-H-CC9-5)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Organic Spectroscopy -I UV Spectroscopy Introduction; types of electronic transitions, end absorption; transition dipole moment and allowed/forbidden transitions; chromophores and auxochromes; Bathochromic and Hypsochromic shifts; intensity of absorptions (Hyper-/Hypochromic effects); relative positions of λ_{max} considering conjugative effect, steric effect, solvent effect, effect of pH. IR Spectroscopy Introduction; modes of molecular vibrations (fundamental and non-fundamental); IR active molecules; application of Hooke's law, force constant; fingerprint region and its significance; effect of deuteration; overtone bands; vibrational coupling in IR; characteristic and diagnostic stretching frequencies of C-H, N-H, O-H, C-O, C-N, C-X, C=C (including skeletal vibrations of aromatic compounds), C=O, C=N, N=O, C $\equiv$ C, C $\equiv$ N; characteristic bending vibrations are included; factors affecting stretching frequencies: effect of conjugation, electronic effects, mass effect, bond multiplicity, ring-size, solvent effect, H-bonding on IR absorptions; application in functional group analysis. NMR Spectroscopy Introduction; nuclear spin; NMR active molecules; basic principles of Proton Magnetic Resonance; choice of solvent and internal standard; equivalent and non-equivalent protons; chemical shift and factors influencing it; ring current effect; significance of the terms: up-/downfield, shielded and deshielded protons; spin coupling and coupling constant (1st order spectra); relative intensities of first-order multiplets: Pascal's triangle; chemical and magnetic equivalence in NMR ; anisotropic effects in alkene, alkyne, aldehydes	1. Kemp. W, Organic Spectroscopy, Macmillan, 3rd Edition, 2022 2. Dyer, Applications of Absorption Spectroscopy of Organic Compounds, Prentice Hall India Learning Private Limited, 1978 3. Pavia. Donald L, Introduction to Spectroscopy, 5th Edition, Cengage India Private Limited, 2015 4. Finar, I. L. Organic Chemistry (Volume 1), Vol 1, 6th Edition (Pearson Education India), 2002. 5. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	20	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)

LESSON PLAN: Semester- (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: ORGANIC CHEMISTRY – III (CHEM-H-CC9-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	and aromatics; Idea about NMR peak area, integration; relative peak positions; rapid proton exchange; interpretation of NMR spectra of simple compounds: Ethanol, diethyl malonate, diethyl fumarate, trans-cinnamic acid, benzene, toluene, benzaldehyde, p-nitrobenzaldehyde, dinitrobenzenes, nitroanilines. Applications of IR, UV and NMR spectroscopy for identification of simple organic molecules				
Module : II	Rearrangements (15 Lectures) Mechanism with evidence (including crossover experiments) and stereochemical features for the following: Rearrangement to electron-deficient carbon Wagner-Meerwein rearrangement, pinacol rearrangement, dienone-phenol; Wolff rearrangement in Arndt-Eistert synthesis, benzil-benzilic acid rearrangement, Demjanov rearrangement, Tiffeneau–Demjanov rearrangement. Rearrangement to electron-deficient nitrogen Rearrangements: Hofmann, Curtius, Lossen, Schmidt and Beckmann. Rearrangement to electron-deficient oxygen Baeyer-Villiger oxidation, cumene hydroperoxide-phenol rearrangement and Dakin reaction. Aromatic rearrangements: Migration from oxygen to ring carbon Fries rearrangement and Claisen rearrangement. Migration from nitrogen to ring carbon N-azo to C-azo rearrangement, Bamberger rearrangement, Orton rearrangement and benzidine rearrangement.	1. Kemp. W, Organic Spectroscopy, Macmillan, 3rd Edition, 2022 2. Dyer, Applications of Absorption Spectroscopy of Organic Compounds, Prentice Hall India Learning Private Limited, 1978 3. Pavia. Donald L, Introduction to Spectroscopy, 5th Edition, Cengage India Private Limited, 2015 4. Finar, I. L. Organic Chemistry (Volume 1), Vol 1, 6th Edition (Pearson Education India), 2002. 5. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	15	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)

LESSON PLAN: Semester- (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: ORGANIC CHEMISTRY – III (CHEM-H-CC9-5)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Nitrogen compounds (10 Lectures) Amines: Aliphatic & Aromatic Preparation, separation (Hinsberg's method) and identification of primary, secondary and tertiary amines; reaction (with mechanism): Eschweiler–Clarke methylation, diazo coupling reaction, formation and reactions of phenylenediamines, diazomethane and diazoacetic ester. Nitro compounds (aliphatic and aromatic) Preparation and reaction (with mechanism): reduction under different conditions; Nef carbonyl synthesis, Henry reaction and conjugate addition of nitroalkane anion. Alkyl nitrile and isonitrile Preparation and reaction (with mechanism): Thorpe nitrile condensation, von Richter reaction. Diazonium salts and their related compounds Reactions (with mechanism) involving replacement of diazo group; reactions: Gomberg, Meerwein, Japp-Klingermann.	1. Kemp. W, Organic Spectroscopy, Macmillan, 3rd Edition, 2022 2. Dyer, Applications of Absorption Spectroscopy of Organic Compounds, Prentice Hall India Learning Private Limited, 1978 3. Pavia. Donald L, Introduction to Spectroscopy, 5th Edition, Cengage India Private Limited, 2015 4. Finar, I. L. Organic Chemistry (Volume 1), Vol 1, 6th Edition (Pearson Education India), 2002. 5. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	10	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)
		Total	45		

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Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: ORGANIC CHEMISTRY – III (CHEM-H-CC9-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	Organic Preparations A. The following reactions (at least 5) are to be performed, noting the yield of the crude product: 1. Nitration of aromatic compounds 2. Condensation reactions 3. Hydrolysis of amides/imides/esters 4. Acetylation of phenols/aromatic amines 5. Side chain oxidation of aromatic compounds 6. Diazo coupling reactions of aromatic amines 7. Bromination of anilides (Bromate-Bromide method) Students must also calculate percentage yield, based upon isolated yield (crude) and theoretical yield. B. Purification of the crude product is to be made by crystallization from water/alcohol, crystallization after charcoal treatment, or sublimation, whichever is applicable. C. Melting point of the purified product is to be noted.	1. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical Organic Chemistry, 5 th Edition, Pearson India, 2003 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	26	Chalk and Talk and Hand on Demonstration	(PR)
	Practice		4		
		Total	30		

LESSON PLAN: Semester-5 (Under CCF) 2025

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – III (CHEM-H-CC10-5 (DSCC-10))

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I (s- and p-block elements)	General properties of s- and p-block elements. Behavior of alkali metals in liquid ammonia. Preparation and structure of basic beryllium acetate and nitrate, beryllium halides. Relative stability of different oxidation states of Groups 13, 14 and 15. Allotropy and catenation. Hydrolytic behavior of the halides of Group 15. Structure and magnetism of gallium dichloride. Preparation, structure, bonding, properties and uses of boric acid, borates, diborane, graphitic compounds, fullerenes	1. J. E. Huheey, E. A. Keiter, R. L. Keiter, Okhil K. Medhi, Principles of Structure and Reactivity, 5th Edition, Pearson India, 2022 2. N. N. Greenwood, & A. Earnshaw, Chemistry of the Elements, Butterworth-Heinemann, 1997.	10	Chalk and Talk	SG
	Oxides and oxoacids of nitrogen, phosphorus, sulphur and chlorine. Preparation, structure and properties of peroxo acids of sulphur, sulphur-nitrogen compounds, interhalogen compounds, polyhalides, pseudo halogens, fluorocarbons. Basic properties of halogens, super halogen. Special properties of helium. Preparation of fluorides, oxides of xenon and perxenates. Clathrates of noble gas elements. Uses of noble gases.		10	Chalk and Talk	SB
	Inorganic polymers: General characteristics, comparison with organic polymers. Preparation, structure and uses of silicones and siloxanes, borazines, polymeric boron nitride (BN) _x , phosphazenes and polythiazyl (SN) _x		10	Chalk and Talk	SB
Module : II (d- and f-block elements)	General comparison of 3d, 4d and 5d elements in terms of oxidation states, metal-metal bond, redox properties of Gr. 6-11	1. Concise Inorganic Chemistry, J. D. Lee, 5th Ed., Wiley India Pvt. Ltd., 2008.	3	Chalk and Talk	SB
	General comparison of lanthanoids and actinoids in terms of electronic configuration, oxidation states, spectral and magnetic properties. Lanthanoid and actinoid contraction. Separation of lanthanides (ion-exchange method only). Uses of lanthanoids and actinoids in spectral, magnetic and theranostic applications.		6	Chalk and Talk	SG
Module : III (Nuclear Model & Radiotracer methods)	Liquid drop model, Shell model, magic numbers. Concept of nuclear quantum number. Spin Isomerism	1. H. J. Arnikar, Essentials of Nuclear Chemistry, 5th Edition, New Age International Pvt. Ltd., 2022	3	Chalk and Talk	SG
	Overview of radioisotope production, radiometric titrations. Radiotracer methods: study of mechanism of chemical reactions, nuclear medicine, isotope dilution analysis.		3	Chalk and Talk	SG
		Total	45		

LESSON PLAN: Semester-5 (Under CCF) 2025

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – III (CHEM-H-CC10-5 (DSCC-10))

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	Analysis of materials of industrial importance 1. Cu and Zn in brass (Complexometry) 2. CaCO_3 and MgCO_3 in Dolomite 3. Cr and Mn in steel 4. Vitamin C 5. DO in water sample 6. Fe_2O_3 in Portland cement 7. Mg in talcum powder	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	28	Chalk and Talk and Hand on Demonstration	(SB)
	Practice		2		
		Total	30		

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)
(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Foundation of Quantum Mechanics	1. Levine, I. N. Physical Chemistry, 6th Edition, McGraw-Hill India, 2011.	5	Chalk and Talk	(AS)
	Particle Aspect of Radiation Blackbody Radiation, Photoelectric Effect, Compton Effect.	2. McQuarrie, D. A. & Simons, J. D. Physical Chemistry: A Molecular Approach, Viva Press, 1997. 3. Atkins, P. W. & Paula, J. de Atkins' Physical Chemistry,	5	Chalk and Talk	(AS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)
(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
		11th Edition, Oxford University Press, 2018. 4. Levine, I.N, Quantum Chemistry, 7th Edition, Pearson, , 2016. 5. McQuarrie, D.A, Quantum Chemistry, 2nd Edition, University Science Books, 2008.			
Module	Particle Aspect of Radiation	1. McQuarrie, D. A. &	2	Chalk and	(AS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)

(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
: II	Blackbody Radiation, Photoelectric Effect, Compton Effect.	Simons, J. D. Physical Chemistry: A Molecular Approach, Viva Press, 1997. 2. Atkins, P. W. & Paula, J. de Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018. 3. Levine, I.N, Quantum Chemistry,		Talk	
	Wave Aspect of particles de Broglie's Hypothesis: Matter Wave, Heisenberg's Uncertainty Principle. Wave packet, time evolution of wave function. Group and Phase Velocities.		6	Chalk and Talk	(AS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)
(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
		7th Edition, Pearson, , 2016. 5. McQuarrie, D.A, Quantum Chemistry, 2nd Edition, University Science Books, 2008.			
	Schrodinger Equation and Wavefunction The time dependent Schrodinger equation. The time-independent Schrodinger equation; nature of the equation, acceptability conditions for the wave functions and probability interpretations of wave function. Vector representation of wave function. Dirac's bra-ket notation. Orthonormality of wave function.	1. Levine, I.N, Quantum Chemistry, 7th Edition, Pearson, , 2016. 2. McQuarrie, D.A, Quantum Chemistry, 2nd Edition, University	6	Chalk and Talk	(AS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)

(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Concept of Operators Elementary concepts of operators, eigenfunctions and eigenvalues; Linear operators; Commutation of operators, commutator and uncertainty relation; Expectation value;	Science Books, 2008.			
	The Postulates and General Principles of Quantum Mechanics Postulates of Quantum Mechanics. Hermitian operators, definition and examples. Theorems about Hermitian operators. Expansion of a function in terms of eigenfunctions. Eigenfunctions of commuting operators.		2	Chalk and Talk	(AS)
			5	Chalk and	(AS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)

(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
				Talk	
Module III	Surface Chemistry Adsorption Physical and chemical adsorption; Freundlich and Langmuir adsorption isotherms; multilayer adsorption and BET isotherm; Gibbs adsorption isotherm and surface excess; Heterogeneous catalysis (single reactant);	1. McQuarrie, D. A. & Simons, J. D. Physical Chemistry: A Molecular Approach, Viva Press, 1997. 2. Atkins, P. W. & Paula, J. de Atkins' Physical Chemistry, 11th Edition, Oxford	9	Chalk and Talk	(IS)
	Colloids		6	Chalk and	(IS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)

(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Lyophobic and lyophilic sols, Origin of charge and stability of lyophobic colloids, Coagulation and Schultz-Hardy rule, Zeta potential and Stern double layer (qualitative idea), Tyndall effect; Electrokinetic phenomena (qualitative idea only); Stability of colloids and zeta potential; Micelles, reverse micelles; micellization equilibrium; thermodynamics of micellization.	University Press, 2018		Talk	
	Electrical Properties of molecules Dipole moment and polarizability Polarizability of atoms and molecules, dielectric constant and polarization, molar polarization for polar and non-polar molecules; Clausius-Mosotti equation and Debye equation (both	1. Atkins, P. W. & Paula, J. de Atkins' Physical Chemistry, 11th Edition, Oxford University	45		

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)
(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	without derivation) and their application; Determination of dipole moments	Press, 2018.			
	CHEM-H-CC11-5-P (DSCC-11)	1. Practical Workbook Chemistry (Honours), UGBS, Chemistry, University of Calcutta, 2015.			
	1. Conductometric Experiments To determine the ionization constant of a weak acid by conductometric method.		12		(AS)
	2. Potentiometric Experiments a) Potentiometric titration of Mohr's salt solution against		4		(AS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)

(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	standard $K_2Cr_2O_7$ and $KMnO_4$ solution and hence determine the standard reduction potential (E^0) of Fe^{+3} / Fe^{+2} couple in the hydrogen scale. b) Determination of concentration of (i) $AgNO_3$ solution and (ii) solubility product of $AgCl$ by potentiometric titration of $AgNO_3$ solution against standard KCl solution. 3. Solubility Product: a) Determination of solubility and solubility product of a sparingly soluble salt in water, and in various electrolytic media by titrimetric method. b) Determination of the activity solubility product of $KHTa$ from the variation of concentrated solubility product with the				

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry (CHEM-H-CC11-5)

(DSCC-11)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	ionic strength of the solution				
		Total	30		

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: ORGANIC CHEMISTRY – IV (CHEM-H-CC12-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Organic Synthesis-I Retrosynthetic analysis Disconnections; synthons, donor and acceptor synthons; natural reactivity and <i>umpolung</i> ; latent polarity in bifunctional compounds; illogical electrophiles and nucleophiles; synthetic equivalents; functional group interconversion and addition (FGI and FGA); C-C disconnections and synthesis: one-group and two-group (1,2- to 1,5-dioxygenated compounds), reconnection (1,6-dicarbonyl); protection-deprotection strategy (alcohol, amine, carbonyl, acid). <i>Strategy of ring synthesis</i> : Thermodynamic and kinetic factors; synthesis of large rings, application of high dilution technique, Favorskii Rearrangement in relation to ring contraction.	1. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2002. 2. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994. 3. Organic Synthesis: The Disconnection Approach, Stuart Warren (Author), Paul Wyatt (Author), 2008. 4. John Joule, Keith Mills, George Smith, Heterocyclic Chemistry, 3rd Edition, 1995, CRC Press. 5. J. Joule, Heterocyclic Chemistry, 5th Edition, Wiley, 2010.	15	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: ORGANIC CHEMISTRY – IV (CHEM-H-CC12-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : II	Carbocycles Polynuclear hydrocarbons and their derivatives Synthetic methods include Haworth, Bardhan-Sengupta, Bogert-Cook (with mechanistic details); fixation of double bonds and Fries rule; reactions (with mechanism) of naphthalene, anthracene and phenanthrene and their derivatives. Heterocycle-I Heterocyclic compounds Reactivity, orientation and important reactions (with mechanism) of furan, pyrrole, thiophene and pyridine; synthesis (including retrosynthetic approach and mechanistic details): pyrrole: Knorr synthesis, Paal-Knorr synthesis, Hantzsch; furan: Paal-Knorr synthesis, Feist-Benary synthesis and its variation; thiophenes: Paal-Knorr synthesis, Hinsberg synthesis; pyridine: Hantzsch synthesis; benzo-fused 5-and 6-membered rings with one heteroatom: reactivity, orientation and important reactions (with mechanistic details) of indole, quinoline and isoquinoline; synthesis (including retrosynthetic approach and mechanistic details): indole: Fischer, quinoline: Skraup, isoquinoline: Bischler-Napieralski synthesis	1. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2002. 2. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994. 3. Organic Synthesis: The Disconnection Approach, Stuart Warren (Author), Paul Wyatt (Author), 2008. 4. John Joule, Keith Mills, George Smith, Heterocyclic Chemistry, 3rd Edition, 1995, CRC Press. 5. J. Joule, Heterocyclic Chemistry, 5th Edition, Wiley, 2010.	18	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: ORGANIC CHEMISTRY – IV (CHEM-H-CC12-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Stereochemistry and Reactions of Alicyclic Compound (12 Lectures) Concept of I-strain (Baeyer's strain theory); conformational analysis: cyclohexane, mono and disubstituted cyclohexane; symmetry properties and optical activity; topomerisation; ring size and ease of cyclisation; conformation & reactivity in cyclohexane system: consideration of steric and stereoelectronic requirements; elimination (E2, E1), nucleophilic substitution (S _N 1, S _N 2, S _N i, NGP), merged substitution-elimination; rearrangements; oxidation of cyclohexanol, esterification, saponification, lactonisation, epoxidation, pyrolytic <i>syn</i> elimination and fragmentation reactions.	1. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2002. 2. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994. 3. Organic Synthesis: The Disconnection Approach, Stuart Warren (Author), Paul Wyatt (Author), 2008. 4. John Joule, Keith Mills, George Smith, Heterocyclic Chemistry, 3rd Edition, 1995, CRC Press. 5. J. Joule, Heterocyclic Chemistry, 5th Edition, Wiley, 2010.	12	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)
		Total	45		

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: ORGANIC CHEMISTRY – IV (CHEM-H-CC12-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	TLC & PAPER CHROMATOGRAPHY – AMINO ACIDS, DYESCOLUMN CHROMATOGRAPHY (DEMO) Chromatographic Separations 1. TLC separation of a mixture containing 2/3 amino acids 2. TLC separation of a mixture of dyes (fluorescein and methylene blue) 3. Paper chromatographic separation of a mixture containing 2/3 amino acids 4. Column chromatographic separation of mixture of dyes (DEMO)	1. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	26	Chalk and Talk and Hand on Demonstration	(PR)
	Practice		4		
		Total	30		

LESSON PLAN: Semester-7 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – V (CHEM-H-CC16-7 (DSCC-16))

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I (Coordination Chemistry – II)	Crystal field theory. Splitting of d-orbitals in linear, trigonal planar, tetrahedral, square planar, trigonal bipyramidal, square pyramidal, octahedral, trigonal prism, pentagonal bipyramidal and cubic fields. Crystal field stabilization energies in weak field and strong field environments. Crystal Field Activation Energy and its Application, Nephelauxetic effect and Nephelauxetic Series, Distorted shapes of complexes (Coordination No. 4, 5) based on Yang and Addison parameters. Microstates, determination of various microstates for different dn configurations, Ground and excited state terms, deduction up to d3 configuration, Qualitative idea of Tanabe-Sugano diagram and evaluation of 10Dq and B values. Interpretation of electronic spectra of d2, d3, d7, d8 systems from simplified Tanabe Sugano diagram.	1. J. E. Huheey, E. A. Keiter, R. L. Keiter, Okhil K. Medhi, Principles of Structure and Reactivity, 5 th Edition, Pearson India, 2022	12	Chalk and Talk	SB
Module : II (EPR and Mössbauer Spectroscopy)	EPR Spectroscopy: Principle, comparison with NMR spectroscopy, line-width, nuclear hyperfine interactions, splitting constant, allowed transitions using energy diagram - $\dot{H}$, $\dot{CH}_3$, $Cu(acac)_2$, $VO(acac)_2$ Mössbauer Spectroscopy: Principle, Mössbauer energy levels with isomer shift, line-width, center shift, quadrupole interaction, quadrupole splitting and hyperfine interaction with reference to ^{57}Fe . Information of spin and oxidation states of Fe nuclei in variety of environments.	1. Inorganic Chemistry – D. F. Shriver, P. W. Atkins & C. H. Langford	12	Chalk and Talk	SG
Module : III (Bioinorganic Chemistry-II)	Ionophores, Metal ion Transport (Na^+/K^+ ion). Na^+/K^+ ion pump. Bioenergetic principle and role of ATP. Active site structure, function, mechanism of action and synthetic model system for various metalloenzymes: carbonic anhydrase, carboxypeptidase, superoxide dismutase, catalase, peroxidase. Photosynthesis, Chlorophyll, PS-I, PS-II, photosynthetic electron transport chain. Vitamin B12. Toxicity of metal ions (As, Pb, Hg) and their effects, LD50 (basic idea only), chelation therapy, Pt, Rh, Ru and Au complexes in medicine (examples only). Metal dependent diseases – Wilson's and Alzheimer's diseases.	1. Inorganic Chemistry – D. F. Shriver, P. W. Atkins & C. H. Langford	12	Chalk and Talk	SB

LESSON PLAN: Semester-7 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – V (CHEM-H-CC16-7 (DSCC-16))

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : IV (Organometallic Chemistry – II)	Stereochemical non-rigidity and fluxional behaviour of $[\text{Ti}(\eta^1\text{-Cp})_2(\eta^5\text{-Cp})_2]$ (characterization with ^1H NMR). Isolobal and isoelectronic relationships with examples (MO approach). Structure and bonding (evidence from IR/bond length data) in metal-allyl, metal-alkyne complexes with typical examples: $[\text{Ni}(\eta^3\text{-C}_3\text{H}_5)_2]$, $[\text{Co}_2(\text{CO})_6(\text{C}_2\text{H}_2)]$, $[(\text{PPh}_3)_2\text{Pt}(\text{C}_2\text{Ph}_2)]$ and $[\text{PtCl}_2(\text{ArNH}_2)(\text{C}_2\text{Bu}^t_2)]$. MO diagram of ferrocene. C–H bond activation by organometallic complexes – cyclometallation reactions. Metal-Carbon bonding in Fischer and Schrock type carbene and carbyne complexes. Organometallic compounds as drugs (examples only) and sensors.	1. J. E. Huheey, E. A. Keiter, R. L. Keiter, Okhil K. Medhi, Principles of Structure and Reactivity, 5 th Edition, Pearson India, 2022	12	Chalk and Talk	SG
Module : V (Electrochemical Analyses)	Voltammetry: cyclic voltammetry, polarography, anodic stripping voltammetry; amperometry, coulometry, electrogravimetry and numerical problems therein.	1. Electroanalytical Chemistry –A. J. Bard	12	Chalk and Talk	SG
		Total	60		
Tutorial	1. Applications of Mossbauer Spectroscopy in Biomimetic Chemistry of Fe metalloproteins 2. Bioremediation of Metals 3. Biological Defense Mechanism 4. Application of Transition Metal Organometallic Compounds in Click Chemistry 5. Application of Cyclic Voltammetry in Transition Metal complexes. 6. Composite Materials. 7. Bioorganometallic Chemistry. 8. Application of Tanabe Sugano diagram in determination of Δ_o for d1, d2, d3, d4 (H.S.), d6 (H.S.), d7 (H.S.), d8, d9 metal complexes. 9. Jahn – Teller distortion and its applications in solid state chemistry and materials. 10. Fischer and Shrock carbene complexes.	Study materials, review articles, book chapters etc.	30	Chalk and Talk	SG
		Total	30		

LESSON PLAN: Semester-VII (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Priyabrata Roy (PR)

Paper Name & Code: Chemistry (CHEM-H-CC17-7)
(DSCC-17)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Aromaticity & Linear Free Energy Relationships Aromaticity: Hückel MO treatment of acyclic and cyclic conjugated systems (Interaction Matrix, Formulation of Determinants and Solving for E and c values from Secular Equations) for Ethylene, allyl systems, 1,3-butadiene, cyclopropenyl systems, cyclobutadiene systems and benzene; Hückel's rule and concept of aromaticity: annulenes (upto [18]-annulene), fulvenes and fulvalenes, fullerenes (C60), charged systems (upto 7 membered), anti-aromaticity, homoaromaticity; graphical methods-Frost diagram. Definition with examples for Alternate and Non alternate Hydrocarbons. Linear Free Energy Relationship: Introduction, Hammett Plots, Hammett equations: Substituent Constant (σ), Reaction Constant (ρ), Significance of σ and ρ, Concept of through- conjugation, Yukawa-Tsuno Equation. Use of Hammett Plots: Calculation of k and K values, Deviation from straight line plots- Acetolysis of 3-aryl-2-butyl brosylates, Cyclodehydration of 2	1. Jonathan Clayden, Nick Greeves & Stuart Warren – Organic Chemistry (2nd Edition) 2. Peter Sykes – A Guidebook to Mechanism in Organic Chemistry 3. Ian Fleming – Molecular Orbitals and Organic Chemical Reactions	12 Lectures	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)

LESSON PLAN: Semester-VII (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Priyabrata Roy (PR)

Paper Name & Code: Chemistry (CHEM-H-CC17-7)
(DSCC-17)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	phenyltriarylmethanols.				
Module – II	Pericyclic Reactions Introduction to Pericyclic reactions, mechanism, stereochemistry, regioselectivity in case of: Cycloaddition reactions: FMO approach, Diels-Alder reaction, photochemical [2+2] cycloadditions. Correlation diagram for [2+2] and [4+2] cycloaddition reaction. Electrocyclic reactions: FMO approach involving 4π - and 6π -electrons (thermal and photochemical) and corresponding cycloreversion reactions. Correlation diagram for cyclobutene ring opening. Sigmatropic reactions: FMO approach, sigmatropic shifts and their order; [1,3] and [1,5] H shifts and [3,3] shifts with reference to Claisen and Cope rearrangements.	1. Ian Fleming Pericyclic Reactions 2. Sankararaman Pericyclic Reactions	12 Lectures	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)
Module – III	Alkaloids & Terpenoids Terpenoids: Isoprene rule, structure elucidation (by chemical and spectroscopical methods), Synthesis and Medicinal Use of representative examples of acyclic (Citral), monocyclic (Camphor) and bicyclic monoterpenes (Caryophyllene); structural types:	1. O.P. Agarwal – Chemistry of Organic Natural Products 2. I.L. Finar – Organic Chemistry, Volume 2	12 Lectures	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and	(PR)

LESSON PLAN: Semester-VII (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Priyabrata Roy (PR)

Paper Name & Code: Chemistry (CHEM-H-CC17-7)
(DSCC-17)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	general concept and examples of sesqui-, di- and tri-terpenoids. Alkaloids: Hoffmann's exhaustive methylation, Emde's modification, classifications, familiarity with methods (chemical and spectroscopic) for structure elucidation, synthesis and biological activity of hygrine, nicotine, coniine and papaverine. Medicinal importance of Nicotine, Hygrine, Quinine, Morphine, Cocaine and Reserpine.			distribution of study materials.	
Module – IV	Green Chemistry – I Introduction to Green Chemistry: What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/ Obstacles in the pursuit of the goals of Green Chemistry Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following: • Designing a Green Synthesis using these principles: Prevention of Waste/Byproducts, Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination	1. Anastas & Warner Green Chemistry: Theory and Practice 2. V.K. Ahluwalia Green Chemistry 3. V.K. Ahluwalia & M. Kidwai New Trends in Green Chemistry	12 Lectures	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)

LESSON PLAN: Semester-VII (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Priyabrata Roy (PR)

Paper Name & Code: Chemistry (CHEM-H-CC17-7)
(DSCC-17)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	reactions. • Prevention/minimization of hazardous/toxic products. • Green solvents–supercritical fluids, water as a solvent for organic reactions, ionic liquids, PEG, solventless processes. • Energy requirements for reactions–alternative sources of energy: use of microwaves and ultrasonic energy. • Use of catalytic reagents in preference to stoichiometric reagents, catalysis and green chemistry. Future Trends in Green Chemistry: Qualitative idea (definition, representative example and importance) about Biomimetic, Multifunctional reagents, Combinatorial green chemistry. Green chemistry in sustainable development.				
Module –V	Green Chemistry – II 1. Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis). 2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols, microwave assisted reactions in organic solvents,	1. Anastas & Warner Green Chemistry: Theory and Practice 2. V.K. Ahluwalia Green Chemistry 3. V.K. Ahluwalia & M.	12 Lectures	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)

LESSON PLAN: Semester-VII (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Priyabrata Roy (PR)

Paper Name & Code: Chemistry (CHEM-H-CC17-7)
(DSCC-17)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Diels-Alder reaction and Decarboxylation reaction. 3. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine) 4. Green counterpart of common organic reactions: Friedel-Crafts, Michael and Cannizzaro reactions, Aldol, Knoevenagel, Benzoin and Dieckmann condensations. 5. Rearrangement reactions by green approach: Fries rearrangement, Claisen rearrangement, Beckmann rearrangement, Baeyer-Villiger oxidation.	Kidwai New Trends in Green Chemistry			
Tutorial:	A. Multistep organic synthesis and monitoring the reaction progress by TLC. Students must also calculate percentage yield, based upon isolated yield (crude) and theoretical yield. B. Purification of the crude product is to be made by crystallization from water/alcohol, crystallization after charcoal treatment, or sublimation, whichever is applicable.	1. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical Organic Chemistry, 5 th Edition, Pearson India, 2003 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta,	30 Lectures	Chalk and Talk and Hand on Demonstration	(PR)

LESSON PLAN: Semester-VII (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Priyabrata Roy (PR)

Paper Name & Code: Chemistry (CHEM-H-CC17-7)
(DSCC-17)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	C. Melting point of the purified product is to be noted.	2015			

LESSON PLAN: Semester- (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS) Dr Ishita Saha (IS)

PAPER: DSCC 18 Physical Chemistry V

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Mathematical Concepts Elements of Calculus, Legendre transformation: Application to thermodynamics, Extremum principle, Constrained extremization: Example and application in Physical Chemistry.	1. Levine, I. N. Physical Chemistry, 6th Edition, McGraw-Hill India ,2011.	4	Chalk and Talk	(AS)
	Power series: Convergence and divergence, Taylor series: Example and application in Physical Chemistry, Matrices: Finding eigenvectors and eigenvalues and applications		8	Chalk and Talk	(AS)
Module : II	Atomic Spectra Magnetic Effects on Atomic Spectra: Zeeman effect, fine structure, concept of spin;	Atkins, P. W. & Paula, J. de Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018.	6	Chalk and Talk	(IS)
	spin-orbit interaction, effect of high magnetic field, Lande g factor, Atomic (and molecular) terms	2. Daniel C Harris, Symmetry and Spectroscopy, (Dover Books on Chemistry), 1989 3. F.W. Billmeyer, Textbook of Polymer Science, 3rd ed. Wiley-Inter science (1984) 11. Physical Chemistry – R. S. Berry, S. A. Rice, J. Ross 4.	6	Chalk and Talk	(IS)

LESSON PLAN: Semester- (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS) Dr Ishita Saha (IS)

PAPER: DSCC 18 Physical Chemistry V

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
		Introduction to Atomic Spectra – H.E. White			
Module III	Chemical Kinetics III Fast and ultra-fast kinetics: Luminescence and Energy transfer processes, Study of kinetics: Stopped flow, Relaxation, Magnetic resonance method and Flash photolysis, Autocatalysis,	1. McQuarrie, D. A. & Simons, J. D. Physical Chemistry: A Molecular Approach, Viva Press, 1997.	4	Chalk and Talk	(IS)
	Prey-predator model, oscillating reactions (Belousov-Zhabotinskii reaction), Electrode kinetics:	2. Atkins, P. W. & Paula, J. de Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	4	Chalk and Talk	(IS)
	Nernst equation, Butler-Volmer equation, Tafel equation, Tafel plot etc.	1. Atkins, P. W. & Paula, J. de Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018.	4	Chalk and Talk	(IS)
Module IV	Polymer Chemistry Chain and branched Polymers, Kinetics and mechanisms of polymerization: Step-growth vs. chain-growth,	1. Practical Workbook Chemistry (Honours), UGBS, Chemistry, University of Calcutta,	6	Chalk and Talk	(IS)

LESSON PLAN: Semester- (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS) Dr Ishita Saha (IS)

PAPER: DSCC 18 Physical Chemistry V

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Thermodynamics of polymer solutions. Molecular weight of polymer and its distribution: Number-average and weight average.	2015.	6		(IS)
Module V	Absorption and Emission Spectroscopy Lambert-Beer's Law, Absorption measurement and its limitations, Einstein's two-level transition model: Maser, Population inversion and Laser, Einstein coefficients, Transition moment integral and their relation to molar extinction coefficient,		4		(AS)
	Photo-induced charge transfer, Proton transfer and electron transfer processes, Delayed emission, Excimer, Exciplex, Polarization characteristics of emission, Fluorescence Quenching (Static and Dynamic), Steady state and time-resolved Fluorescence measurement and limitations	Total	8		

LESSON PLAN: Semester- (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS) Dr Ishita Saha (IS)

PAPER: DSCC 18 Physical Chemistry V

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Tutorial	Python Fundamentals (Basic Programming)-I Python environment and execution Variables, data types, and operators Input/output statements • Control statements • (i) The if statement • (ii) The if....else statement • (iii) The if....elif....else statement • Looping • (i) The while Loop • (ii) The for Loop • (iii) Nested Loops • (iv) The break and continue statements Simple Programs 1. Write a python program to test whether a given number is even or odd	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India.	15		

LESSON PLAN: Semester- (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS) Dr Ishita Saha (IS)

PAPER: DSCC 18 Physical Chemistry V

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	2. Write a python program to display even numbers between 100 and 200 3. Write a python program to display numbers from 10 to 1 in descending order. 4. Write a python program to write a function that returns the result of sum of two numbers. 5. Write a python program to generate Fibonacci number series. 6. Write a python program to calculate the Sine value of a given angle in degrees by evaluating (a) Sine series, (b) Cosine series 7. Write a python program to evaluate exponential series.				

LESSON PLAN: Semester-7 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry Practical-04 (CHEM-H-CC19-7 (DSCC-19))

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	Qualitative/semimicro analysis of mixtures containing six radicals with composition. Cation Radicals: Na^+ , K^+ , Ca^{2+} , Sr^{2+} , Ba^{2+} , Al^{3+} , Cr^{3+} , $\text{Mn}^{2+}/\text{Mn}^{4+}$, Fe^{3+} , $\text{Co}^{2+}/\text{Co}^{3+}$, Ni^{2+} , Cu^{2+} , Zn^{2+} , Pb^{2+} , Cd^{2+} , Bi^{3+} , $\text{Sn}^{2+}/\text{Sn}^{4+}$, $\text{As}^{3+}/\text{As}^{5+}$, $\text{Sb}^{+3/+5}$, NH_4^+ Anion Radicals: F^- , Cl^- , Br^- , BrO_3^- , I^- , IO_3^- , SCN^- , S^{2-} , SO_4^{2-} , NO_3^- , NO_2^- , PO_4^{3-} , AsO_4^{3-} , BO_3^{3-} , CrO_4^{2-} / $\text{Cr}_2\text{O}_7^{2-}$, $\text{Fe}(\text{CN})_6^{4-}$, $\text{Fe}(\text{CN})_6^{3-}$. Cation and anion radicals derived from some rare elements: Ti^{4+} , Zr^{4+} , Ce^{4+} , V^{5+} , Mo^{6+} , W^{6+} . Insoluble Materials: $\text{Al}_2\text{O}_3(\text{ig})$, $\text{Fe}_2\text{O}_3(\text{ig})$, $\text{Cr}_2\text{O}_3(\text{ig})$, SrSO_4 , BaSO_4 , CaF_2 , PbSO_4 , TiO_2 , ZrO_2 , CeO_2 . The unknown mixture should contain two cations/anions derived from rare elements.	Svehla & Sivasankar , Vogel's Qualitative Inorganic Analysis, 7th Ed., Pearson, 2012.	60	Chalk and Talk and hands on experiment	SB
		Total	60		

ESSON PLAN: Semester- (Under CCF) Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS)

**PAPER: DSCC 20
Physical Chemistry V**

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Practical		10		
	1. pH-metric Study a) Titration of a strong/weak acid vs strong base and determination of unknown concentration of the acid b) Determination of pK _a value of a weak (mono/di) basic acid	1. Practical Chemistry Workbook (Honours), UGBOS, Chemistry, University of Calcutta, 2015			
	2. Spectrophotometric Study a) Determination of λ_{max} of K ₂ Cr ₂ O ₇ and KMnO ₄		40		
	b) Testing of validity of Lambert–Beer’s law for K ₂ Cr ₂ O ₇ and KMnO ₄ and hence determination of concentration of the given solutions c) Determination of extinction coefficient of K ₂ Cr ₂ O ₇ and KMnO ₄ at λ_{max} using Lambert – Beer’s law d) Determination of pK _{in} value of acid-base indicators (Bromocresol Green, Methyl orange and Phenolphthalein) e) Study of kinetics of the reaction between S ₂ O ₈ ²⁻ and I ⁻ and determination of the rate constant f) Study of kinetics of the reaction between Crystal Violet and OH ⁻ and determination of the rate constant				
	3. Physicochemical Study a) Study of the phase diagram of phenol-water system in presence of a substance which increases the CST. b) Study of the phase diagram of phenol-water system in presence of a substance which decreases the CST		10		

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Skill Enhancement Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-SEC1-1

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I Introduction to Quantitative analysis and its interdisciplinary nature:	Definitions of analysis, determination, measurement, techniques and methods. Classification of analytical techniques. Choice of an analytical method -accuracy, precision, sensitivity, selectivity, method validation. Figures of merit of analytical methods and limit of detection (LOD). Limitations of analytical methods.	Douglas A. Skoog, D.M. West , F. James Holler , Stanley R. Crouch, Fundamentals of Analytical Chemistry , Cengage learning India Pvt Ltd. 10th Edition , 2022	5	Chalk and Talk	(SG)
	Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors. Statistical treatment of finite samples -mean, median, range, standard deviation and variance.		4	Chalk and Talk	(SG)
	External standard calibration -regression equation (least squares method), correlation coefficient (R^2). Presentation of experimental data and results from the point of view of significant figures. Numerical problems are to be solved wherever applicable.		6	Chalk and Talk	(SG)
Module : II Titrimetric analysis:	Principle , classification, normality, molarity, molality, mole fraction, ppm, ppb etc. Standard solutions, preparation and dilution of reagents/ solutions using $N_1V_1 = N_2V_2$, preparation of ppm level solutions from source materials(salts). Numerical problems are to be solved wherever applicable.	Daniel C. Harris , Quantitative Chemical Analysis , 10th Edition , W.H. Freeman , 2020	2	Chalk and Talk	(SB)
	Acid-base titrimetry: Titration curves for strong acid vs strong base, weak acid vs strong base and weak base vs strong acid titrations. Quantitative applications – selecting and standardizing a titrant, inorganic analysis - alkalinity, acidity. Numerical problems are to be solved wherever applicable.		3	Chalk and Talk	(SB)

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Skill Enhancement Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-SEC1-1

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Redox titrimetry: Theory, balancing redox equations, titration curves, theory of redox indicators and applications. Numerical problems are to be solved wherever applicable.		3	Chalk and Talk	(SB)
	Precipitation titrimetry: Theory, titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences. Numerical problems are to be solved wherever applicable.		2	Chalk and Talk	(SB)
	Complexometric titrimetry: Theory, titration methods employing EDTA (direct, back, displacement and indirect determinations). Indicators for EDTA titrations - theory of metal ion indicators. Determination of hardness of water. Numerical problems are to be solved wherever applicable.		3	Chalk and Talk	(AS)
	Gravimetric Analysis: Stages in gravimetric analysis, requisites of precipitation, theories of precipitation, factors influencing precipitation, co-precipitation and post precipitation. Structure, specificity, conditions and applications of organic reagents such as salicylaldehyde, oxine, dimethyl glyoxime, cupron and cupferron in inorganic analysis. Advantages of organic reagents over inorganic reagents.		2	Chalk and Talk	(SG)

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Skill Enhancement Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-SEC1-1

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Water analysis: 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.)	Douglas A. Skoog, D.M. West, F. James Holler, Stanley R. Crouch, Fundamentals of Analytical Chemistry, Cengage Learning India Pvt Ltd. 10th Edition, 2022	5	Chalk and Talk	(AS)
	Water treatment technologies: 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. Numerical problems are to be solved wherever required		5	Chalk and Talk	(AS)
	Basic laboratory practices: 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.		5	Chalk and Talk	(AS)
		Total	45		

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Skill Enhancement Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-SEC1-1

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Tutorial:	1. Safety Practices in the Chemistry Laboratory, knowledge about common toxic chemicals and safety measures in their handling, cleaning and drying of glass wares.	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed.,	3	Chalk and Talk and Demonstration	(IS)
	2. Calibration of glassware, pipette, burette and volumetric flask.	Pearson, 2009.	2	Chalk and Talk and Demonstration	(IS)
	3. Preparation of TLC plates and separation of amino acids	2. Practical Workbook Chemistry (Honours), UGBS, Chemistry, University of Calcutta, 2015	2	Chalk and Talk and Demonstration	(IS)
	4. Calibration of instruments like colorimeter, pH-meter, conductivity meter, spectrophotometer using reference standards or reference materials.		3	Chalk and Talk and Demonstration	(IS)
	5. Conductometric titration between HCl and NaOH.		2	Chalk and Talk and Demonstration	(IS)
	6. Determination of alkali present in soaps/detergents.		3	Chalk and Talk and Demonstration	(IS)
		Total	15		

LESSON PLAN: Semester-III (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Introduction to Numerical Methods for Chemists (CHEM-H-SEC3-3)

Planned			After Implementation	
Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Numbers and Precision Fixed -point representation, Floating - point representation, Floating-point arithmetic, Errors in numbers, Binary representation of numbers. Finding Roots Iterative methods, Newton - Raphson Method.	1. Erwin Kreyszig, Advanced Engineering Mathematics, 10Th Edition, Wiley India 2. Mortimer, R. Mathematics for Physical Chemistry. 3rd Ed. Elsevier (2005). 3. S. R. Crouch, F. J. Holler, Applications of MS Excel in Analytical Chemistry. 4. Thomson, 2004. McQuarrie, D. A. Mathematics for Physical Chemistry University Science Books (2008).	11	Chalk and Talk and Study Material given	(IS)
Linear Regression Least square fit to a straight line, Polynomial regression. Coefficient of Determination, Correlation, Linear Correlation coefficient (r). Interpolation Lagrange Interpolation		11	Chalk and Talk and Study material given	(AS)
Numerical Differentiation Method of finite differences (Forward difference, Backward difference, Central difference). The second derivative. Numerical Integration Trapezoidal approximation (Taylor series interpretation, Geometric interpretation, Composite Trapezoidal Rule), Midpoint Rule, Simpson's 1/3rd Rule.		11	Chalk and Talk and study materiel given	(IS)
Numerical solution of Differential Equation (ODE Only) First Order Method (Euler) and extension to fourth order (Runge-Kutta) The Fourier Transform		12	Talk using ICT and Study material given	(AS)

LESSON PLAN: Semester-III (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Introduction to Numerical Methods for Chemists (CHEM-H-SEC3-3)

Planned			After Implementation	
Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Fourier series and Fourier Transform				
	Total	45		
Tutorial 1. Make a table of the form below to present the results in each case. Draw graphs as required. In the problems, take $a=\pi$ and $b=e$, and $x_j = 0.1, 0.3, 0.5, 0.8, 1, 2, 3, 5, 7, 10, 20, 25$ to get y_j . Use these values in the table for calculations. Report M and C with graph(s). Find out a,b from M and C. Match with the input values a) $y=ax + b$, b) $y = ax / (1+bx)$ 2. Find the molar volume of Argon ($a= 1.50 \text{ L}^2 \text{ atm mol}^{-2}$, $b= 0.032 \text{ L mol}^{-1}$) at 144 K and 30atm pressure, and hence densities of liquid and vapor formed using the van der Waals equation of state. 3. The ionization potential and electron affinity values of a few elements of a periodic table are given below, along with Pauling electronegativities. Show that the Mulliken electronegativities values, defined by $(IP + EA) / 2$, bears a good correlation with the Pauling values. [$EN(P) \approx EN(M) / 270$].		15	Hand on Demonstration using Computer (ICT)	(AS)
	Total	15		

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Interdisciplinary Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-IDC1-1

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I Introduction to Quantitative analysis and its interdisciplinary nature:	Definitions of analysis, determination, measurement, techniques and methods. Classification of analytical techniques. Choice of an analytical method -accuracy, precision, sensitivity, selectivity, method validation. Figures of merit of analytical methods and limit of detection (LOD). Limitations of analytical methods.	Douglas A. Skoog, D.M. West , F. James Holler , Stanley R. Crouch, Fundamentals of Analytical Chemistry , Cengage learning India Pvt Ltd. 10th Edition , 2022	4	Chalk and Talk	(SG)
	Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors. Statistical treatment of finite samples -mean, median, range, standard deviation and variance.		3	Chalk and Talk	(SG)
	External standard calibration -regression equation (least squares method), correlation coefficient (R^2). Presentation of experimental data and results from the point of view of significant figures.		3	Chalk and Talk	(SG)
Module : II Titrimetric analysis:	Principle , classification, normality, molarity, molality, mole fraction, ppm, ppb etc. Standard solutions, preparation and dilution of reagents/ solutions using $N_1V_1 = N_2V_2$, preparation of ppm level solutions from source materials (salts).	Daniel C. Harris , Quantitative Chemical Analysis , 10th Edition , W.H. Freeman , 2020	2	Chalk and Talk	(SB)
	Acid-base titrimetry: Titration curves for strong acid vs strong base, weak acid vs strong base and weak base vs strong acid titrations.		2	Chalk and Talk	(SB)
	Redox titrimetry: Theory, balancing redox equations, titration curves.		2	Chalk and Talk	(SB)

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Interdisciplinary Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-IDC1-1

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Precipitation titrimetry: Theory, titration curves, indicators for precipitation titrations.		2	Chalk and Talk	(SB)
	Complexometric titrimetry: Theory, titration methods employing EDTA (direct, back, displacement and indirect determinations). Indicators for EDTA titrations. Determination of hardness of water.		2	Chalk and Talk	(IS)
Module : III	Water analysis: 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.)	Douglas A. Skoog, D.M. West, F. James Holler, Stanley R. Crouch, Fundamentals of Analytical Chemistry, Cengage learning India Pvt Ltd. 10th Edition, 2022	3	Chalk and Talk	(IS)
	Water treatment technologies: 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.		3	Chalk and Talk	(IS)
	Basic laboratory practices: Basic laboratory practices, calibration of glassware (pipette, burette and volumetric flask), Sampling(solids and liquids), weighing, drying,		4	Chalk and Talk	(IS)

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Interdisciplinary Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-IDC1-1

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	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.				
		Total	30		
Tutorial:	1. Safety Practices in the Chemistry Laboratory, knowledge about common toxic chemicals and safety measures in their handling, cleaning and drying of glass wares.		3	Chalk and Talk and Demonstration	(IS)
	2. Calibration of glassware, pipette, burette and volumetric flask.		3	Chalk and Talk and Demonstration	(SG)
	3. Preparation of TLC plates and separation of amino acids		3	Chalk and Talk and Demonstration	(SG)
	4. Calibration of instruments like colorimeter, pH-meter, conductivity meter, spectrophotometer using reference standards or reference materials.		3	Chalk and Talk and Demonstration	(IS)
	5. Determination of alkali present in soaps/detergents.		3	Chalk and Talk and Demonstration	(SB)
		Total	15		

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG), Dr Ishita Saha (IS),

Paper Name & Code: Interdisciplinary Course in Chemistry (Chemistry In Daily Life) CHEM-MD-IDC

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Dairy Products	Edward Cox Henry, The Chemical analysis of Foods , Hardcover, Hassell Street Press , 2021	5	Chalk and Talk	(SB)
	Food additives, adulterants, and contaminants		5	Chalk and Talk	(SB)
	Artificial food colorants		5	Chalk and Talk	(SB)
Module : II	Vitamins	B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)	5	Chalk and Talk	(SG)
	Oils and fats		5	Chalk and Talk	(SG)
	Soaps & Detergents		5	Chalk and Talk	(SG)
Module : III	Chemical and Renewable Energy Sources	Fred Billmeyer : Textbook of polymer science; Wiley 3rd edition.	5	Chalk and Talk	(IS)
	Polymers		10	Chalk and Talk	(IS)
		Total	45		
Tutorial	1. Estimation of Vitamin C		4	Chalk and Talk	(SB)
	2. Determination of Iodine number of oil.		3	Chalk and Talk	(IS)
	3. Determination of saponification number of oil.		4	Chalk and Talk	(SG)
	4. Determination of methyl alcohol in alcoholic beverages.		4	Chalk and Talk	(IS)
		Total	15		

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - I (CHEM-H-CC1-1) & Chemistry MDC- I (CHEM-MD-CC1-1)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Extra nuclear structure of atoms Wave-Particle duality; de Broglie hypothesis. Heisenberg's uncertainty principle. Introducing Schrödinger equation. Hydrogen and hydrogen like systems (detailed solution not required) .Concept of Atomic Orbital; shapes of s, p and d orbitals. Radial and angular distribution curves. Extension to multielectronic systems. Aufbau principle and its limitations; Pauli's exclusion principle, Hund's rules and multiplicity.	1.Lee,J.D.Concise Inorganic Chemistry 2. Atkins, Overton, Rourke , Weller , Armstrong; Shriver & Atkins' Inorganic Chemistry, 5th Ed., Oxford University Press (2010). 3.Huheey,J.E.;Keiter,E.A,& Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity	8	Chalk and Talk	(SB)
	Periodicity Effective nuclear charge. Shielding and penetration; Slater's rule. The general idea about modern periodic table, atomic and ionic radii, ionization energy, electron affinity and electronegativity –definition, trends of variation in periodic table and their application in explaining and predicting the chemical behavior of elements and compounds. Electronegativity scales (Pauling's, Mulliken's and Allred-Rochow's scales). Inert pair effect.		7	Chalk and Talk	(SB)
Module : II	Basics of Organic Chemistry Bonding and Physical Properties Valence Bond Theory: Nomenclature of Organic Compounds, Concept of hybridisation, shapes and structures of molecules, double bond equivalent (DBE), Resonance (including hyperconjugation) and Resonance energy.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003.	2	Chalk and Talk	(PR)
	Electronic displacement: Inductive effect, bond polarization and bond polarizability; steric effect, steric inhibition of resonance.		2	Chalk and Talk	(PR)

Subject Name/Code: Minor & MDC core course

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - I (CHEM-H-CC1-1) & Chemistry MDC- I (CHEM-MD-CC1-1)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	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-,5-7 membered ring systems); Hückel's rules for aromaticity up to [8] annulene; concept of antiaromaticity; non-aromatic molecules.		4	Chalk and Talk	(PR)
	Physical properties Melting point/boiling point and solubility of common organic compounds in terms of covalent & non-covalent intermolecular forces; polarity of molecules and dipole moments.		2	Chalk and Talk	(PR)
	Stereochemistry – I: Bonding geometries of carbon compounds and representation of molecules: tetrahedral nature of carbon and concept of asymmetry; Fischer, sawhorse, flying wedge and Newman projection formulae and their inter translations. Concept of chirality and symmetry: symmetry elements, molecular chirality and centre of chirality; asymmetric and dissymmetric molecules; enantiomers and diastereomers; concept of stereogenicity, chiral centres and number of stereoisomers: systems involving 1/2-chiral centre(s).	1. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd , 2020	5	Chalk and Talk	(PR)

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - I (CHEM-H-CC1-1) & Chemistry MDC- I (CHEM-MD-CC1-1)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Thermodynamics -I : Concept of systems (open, closed and isolated) and surroundings. State of a system; Intensive and extensive variables. Partial derivatives. Exact and inexact differentials. Path function and State function. Concept of heat and work. Zeroth law of thermodynamics. Concept of thermodynamic reversibility. Concept of internal energy and 1st law of thermodynamics. Enthalpy and heat capacity, Relations between C_p and C_v . Isothermal and Adiabatic processes ; Calculations of ΔU , ΔH , q and w involving ideal gases in different processes. Enthalpy of reaction. Hess's law. Enthalpy of formation and combustion. Kirchhoff's equation.	1. Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011 2. Castellan, G. W. Physical Chemistry, Narosa , 2004	9	Chalk and Talk	(IS)
	Chemical Kinetics-I: Concept of order and molecularity. Rate laws for zero, 1st and 2nd order reactions and in general for any n-th order reaction. Determination of order of a reaction by half-life and differential methods. Rate determining step and steady state approximation. Opposing, Consecutive and parallel reactions (first order steps only). Temperature dependence of rate constant and Arrhenius equation.	3. Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	6	Chalk and Talk	(IS)
		Total	45		

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - I (CHEM-H-CC1-1) & Chemistry MDC- I (CHEM-MD-CC1-1)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	(1) Calibration and use of apparatus. (2) Preparation of primary standard solutions (Oxalic Acid and $K_2Cr_2O_7$)	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	6	Chalk and Talk and Hand on Demonstration	(SG)
	Acid-Base Titrations: (3) Standardization of NaOH standard oxalic acid solution. (4) Estimation of carbonate and bicarbonate present together in a mixture (5) Estimation of acetic acid in commercial Vinegar.		8		(SG)
	Oxidation-Reduction Titrimetry: (6) Standardization of $KMnO_4$ standard oxalic acid solution. (7) Estimation of Fe(II) using standardized $KMnO_4$ solution. (8) Estimation of Fe(III) using standard $K_2Cr_2O_7$ solution. (9) Estimation of Fe(II) and Fe(III) in a given mixture using standard $K_2Cr_2O_7$ solution.		12		(SG)
	Practice		4		(SG)
		Total	30		

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - I (CHEM-H-CC1-3) & Chemistry MDC- I (CHEM-MDCC1-3)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Extra nuclear structure of atoms Wave-Particle duality; de Broglie hypothesis. Heisenberg's uncertainty principle. Introducing Schrödinger equation. Hydrogen and hydrogen like systems (detailed solution not required) .Concept of Atomic Orbital; shapes of s, p and d orbitals. Radial and angular distribution curves. Extension to multielectronic systems. Aufbau principle and its limitations; Pauli's exclusion principle, Hund's rules and multiplicity.	1.Lee,J.D.Concise Inorganic Chemistry 2. Atkins, Overton, Rourke , Weller , Armstrong; Shriver & Atkins' Inorganic Chemistry, 5th Ed., Oxford University Press (2010). 3.Huheey,J.E.;Keiter,E.A,& Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity	8	Chalk and Talk	(SB)
	Periodicity Effective nuclear charge. Shielding and penetration; Slater's rule. The general idea about modern periodic table, atomic and ionic radii, ionization energy, electron affinity and electronegativity –definition, trends of variation in periodic table and their application in explaining and predicting the chemical behavior of elements and compounds. Electronegativity scales (Pauling's, Mulliken's and Allred-Rochow's scales). Inert pair effect.		7	Chalk and Talk	(SB)
Module : II	Basics of Organic Chemistry Bonding and Physical Properties Valence Bond Theory: Nomenclature of Organic Compounds, Concept of hybridisation, shapes and structures of molecules, double bond equivalent (DBE), Resonance (including hyperconjugation) and Resonance energy.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003.	2	Chalk and Talk	(PR)
	Electronic displacement: Inductive effect, bond polarization and bond polarizability; steric effect, steric inhibition of resonance.		2	Chalk and Talk	(PR)

Subject Name/Code: Minor & MDC core course

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - I (CHEM-H-CC1-3) & Chemistry MDC- I (CHEM-MDCC1-3)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	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-,5-7 membered ring systems); Hückel's rules for aromaticity up to [8] annulene; concept of antiaromaticity; non-aromatic molecules.		4	Chalk and Talk	(PR)
	Physical properties Melting point/boiling point and solubility of common organic compounds in terms of covalent & non-covalent intermolecular forces; polarity of molecules and dipole moments.		2	Chalk and Talk	(PR)
	Stereochemistry – I: Bonding geometries of carbon compounds and representation of molecules: tetrahedral nature of carbon and concept of asymmetry; Fischer, sawhorse, flying wedge and Newman projection formulae and their inter translations. Concept of chirality and symmetry: symmetry elements, molecular chirality and centre of chirality; asymmetric and dissymmetric molecules; enantiomers and diastereomers; concept of stereogenicity, chiral centres and number of stereoisomers: systems involving 1/2-chiral centre(s).	1. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd , 2020	5	Chalk and Talk	(PR)

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - I (CHEM-H-CC1-3) & Chemistry MDC- I (CHEM-MDCC1-3)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Thermodynamics -I : Concept of systems (open, closed and isolated) and surroundings. State of a system; Intensive and extensive variables. Partial derivatives. Exact and inexact differentials. Path function and State function. Concept of heat and work. Zeroth law of thermodynamics. Concept of thermodynamic reversibility. Concept of internal energy and 1st law of thermodynamics. Enthalpy and heat capacity, Relations between C_p and C_v . Isothermal and Adiabatic processes ; Calculations of ΔU , ΔH , q and w involving ideal gases in different processes. Enthalpy of reaction. Hess's law. Enthalpy of formation and combustion. Kirchhoff's equation.	1. Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011 2. Castellan, G. W. Physical Chemistry, Narosa , 2004	9	Chalk and Talk	(AS)
	Chemical Kinetics-I: Concept of order and molecularity. Rate laws for zero, 1st and 2nd order reactions and in general for any n-th order reaction. Determination of order of a reaction by half-life and differential methods. Rate determining step and steady state approximation. Opposing, Consecutive and parallel reactions (first order steps only). Temperature dependence of rate constant and Arrhenius equation.	3. Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	6	Chalk and Talk	(AS)
		Total	45		

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - I (CHEM-H-CC1-3) & Chemistry MDC- I (CHEM-MDCC1-3)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	(1) Calibration and use of apparatus. (2) Preparation of primary standard solutions (Oxalic Acid and $K_2Cr_2O_7$)	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	6	Chalk and Talk and Hand on Demonstration	(IS)
	Acid-Base Titrations: (3) Standardization of NaOH standard oxalic acid solution. (4) Estimation of carbonate and bicarbonate present together in a mixture (5) Estimation of acetic acid in commercial Vinegar.		8		(IS)
	Oxidation-Reduction Titrimetry: (6) Standardization of $KMnO_4$ standard oxalic acid solution. (7) Estimation of Fe(II) using standardized $KMnO_4$ solution. (8) Estimation of Fe(III) using standard $K_2Cr_2O_7$ solution. (9) Estimation of Fe(II) and Fe(III) in a given mixture using standard $K_2Cr_2O_7$ solution.		12		(IS)
	Practice		4		(IS)
		Total	30		

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I(CHEM-MD-CC3-3)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Aromatic Substitution: Electrophilic aromatic substitution Mechanisms and evidences in favour of it including PKIE; orientation and reactivity; reactions: nitration, nitrosation, sulfonation, halogenation, Friedel-Crafts reaction; one-carbonelectrophiles (reactions: chloromethylation, Houben-Hoesch, Vilsmeier-Haack, Reimer-Tiemann, Kolbe-Schmidt); <i>Ips</i> o substitution. Nucleophilic aromatic substitution Addition-elimination mechanism and evidences in favour of it; SN1 mechanism; <i>cine</i> substitution (benzyne mechanism), structure of benzyne. Birch Reduction of benzenoid aromatics Benzene, Alkylbenzene, Anisole, Benzoic acid (with mechanism). General Treatment of Reaction Mechanism –II Concept of organic acids and bases Concept of pK _a and pK _a H, effect of structure, substituent and solvent on acidity and basicity; proton sponge. Tautomerism Basic difference between tautomerism and resonance, prototropy (keto-enol, phenol-keto); 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, basic ideas about valence tautomerism and ring-chain tautomerism.	1. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 2. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	20	Chalk and Talk	(PR)

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I(CHEM-MD-CC3-3)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : II	Stereochemistry –III Conformation-I Basic idea of conformation. Conformational Nomenclature (Newman & Sawhorse): eclipsed, staggered, gauche, syn and anti; Special reference to preferred geometry for β-elimination. Relative stability of conformers on the basis of steric effect: butane-gauche interaction. Substitution and Elimination Reactions: Nucleophilic substitution reactions Substitution at sp^3 centre [systems: alkyl halides, allyl halides, benzyl halides, alcohols, ethers, epoxides, α-halocarbonyls]: mechanisms (with evidence), relative rates & stereochemical features: SN_1, SN_2, SN_2', SN_1' (allylic rearrangement) and SN_i; effects of solvent, substrate structure, leaving group and nucleophiles (including ambident nucleophiles, cyanide & nitrite); substitutions involving NGP (with heteroatoms and phenyl groups). Elimination reactions E_1, E_2, E_1cB and E_i (pyrolytic <i>syn</i> eliminations); formation of alkenes and alkynes; mechanisms (with evidence), reactivity, regioselectivity (Saytzeff/Hofmann) and stereoselectivity; comparison between substitution and elimination reactions, comparison between nucleophilicity and basicity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition, Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 4. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	13	Chalk and Talk	(PR)

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I(CHEM-MD-CC3-3)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Chemistry of alkenes and alkynes 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, <i>syn</i> and <i>anti</i> -hydroxylation, ozonolysis, addition of singlet and triplet carbenes; Simmons-Smith cyclopropanation reaction; electrophilic addition to 1,3-butadiene; concept of kinetic and thermodynamic control of products; radical addition: HBr addition; mechanism of allylic and benzylic bromination in competition with brominations across C=C; use of NBS; interconversion of <i>E</i> and <i>Z</i> alkenes. Addition to C≡C (in comparison to C=C) Mechanism, reactivity, regioselectivity (Markownikoff and anti-Markownikoff addition) and stereoselectivity; reactions: hydrogenation, Hg (II) ion catalysed hydration, hydroboration-oxidation, dissolving metal reduction of alkynes (Birch); reactions of terminal alkynes by exploring its acidity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition, Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 4. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	12	Chalk and Talk	(PR)
		Total	45		
Practical	Identification of Pure Single organic Compound. Solid compounds Oxalic acid, tartaric acid, citric acid, succinic acid, resorcinol, urea, glucose, cane sugar, benzoic acid and salicylic acid Liquid Compounds: Formic acid, acetic acid, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde and nitrobenzene	1. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical Organic Chemistry, 5th Edition, Pearson India, 2003 2. Practical Workbook Chemistry (Honours),	26	Chalk and Talk and Hand on Demonstration	(PR)

LESSON PLAN: Semester-3 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I(CHEM-MD-CC3-3)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Practice	UGBOS, Chemistry, University of Calcutta, 2015	4		
		Total	30		

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I (CHEM-H-CC4-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Aromatic Substitution: Electrophilic aromatic substitution Mechanisms and evidences in favour of it including PKIE; orientation and reactivity; reactions: nitration, nitrosation, sulfonation, halogenation, Friedel-Crafts reaction; one-carbon electrophiles (reactions: chloromethylation, Houben-Hoesch, Vilsmeier-Haack, Reimer-Tiemann, Kolbe-Schmidt); <i>Ips</i>o substitution. Nucleophilic aromatic substitution Addition-elimination mechanism and evidences in favour of it; SN1 mechanism; <i>cine</i> substitution (benzyne mechanism), structure of benzyne. Birch Reduction of benzenoid aromatics Benzene, Alkylbenzene, Anisole, Benzoic acid (with mechanism). General Treatment of Reaction Mechanism – II Concept of organic acids and bases Concept of pKa and pKaH, effect of structure, substituent and solvent on acidity and basicity; proton sponge. Tautomerism Basic difference between tautomerism and resonance, prototropy (keto-enol, phenol-keto); 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, basic ideas about valence tautomerism and ring-chain tautomerism.	1. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 2. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	20	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I (CHEM-H-CC4-5)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : II	Stereochemistry –III Conformation-I Basic idea of conformation. Conformational Nomenclature (Newman & Sawhorse): eclipsed, staggered, gauche, syn and anti; Special reference to preferred geometry for β -elimination. Relative stability of conformers on the basis of steric effect: butane-gauche interaction. Substitution and Elimination Reactions: Nucleophilic substitution reactions Substitution at sp^3 centre [systems: alkyl halides, allyl halides, benzyl halides, alcohols, ethers, epoxides, α -halocarbonyls]: mechanisms (with evidence), relative rates & stereochemical features: SN_1 , SN_2 , SN_2' , SN_1' (allylic rearrangement) and SN_i ; effects of solvent, substrate structure, leaving group and nucleophiles (including ambident nucleophiles, cyanide & nitrite); substitutions involving NGP (with heteroatoms and phenyl groups). Elimination reactions E_1 , E_2 , E_1cB and E_i (pyrolytic <i>syn</i> eliminations); formation of alkenes and alkynes; mechanisms (with evidence), reactivity, regioselectivity (Saytzeff/Hofmann) and stereoselectivity; comparison between substitution and elimination reactions, comparison between nucleophilicity and basicity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition, Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 4. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	13	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I (CHEM-H-CC4-5)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Chemistry of alkenes and alkynes 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, <i>syn</i> and <i>anti</i> -hydroxylation, ozonolysis, addition of singlet and triplet carbenes; Simmons-Smith cyclopropanation reaction; electrophilic addition to 1,3-butadiene; concept of kinetic and thermodynamic control of products; radical addition: HBr addition; mechanism of allylic and benzylic bromination in competition with brominations across C=C; use of NBS; interconversion of <i>E</i> and <i>Z</i> alkenes. Addition to C≡C (in comparison to C=C) Mechanism, reactivity, regioselectivity (Markownikoff and anti-Markownikoff addition) and stereoselectivity; reactions: hydrogenation, Hg (II) ion catalysed hydration, hydroboration-oxidation, dissolving metal reduction of alkynes (Birch); reactions of terminal alkynes by exploring its acidity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition, Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 4. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	12	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	(PR)
		Total	45		
Practical	Identification of Pure Single organic Compound. Solid compounds Oxalic acid, tartaric acid, citric acid, succinic acid, resorcinol, urea, glucose, cane sugar, benzoic acid and salicylic acid Liquid Compounds: Formic acid, acetic acid, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde and nitrobenzene	1. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical Organic Chemistry, 5th Edition, Pearson India, 2003 2. Practical Workbook Chemistry (Honours), UGBOS,	26	Chalk and Talk and Hand on Demonstration	(PR)

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I (CHEM-H-CC4-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Practice	Chemistry, University of Calcutta, 2015	4		
		Total	30		

LESSON PLAN: Semester-5 (Under CCF) 2025

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – I (CHEM-MD CC4-5 (MN-4))

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I (Chemical bonding –II)	Molecular orbital concept of bonding: The approximations of the theory, Linear combination of atomic orbitals (LCAO) (elementary pictorial approach): sigma and pi bonds 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 ₂ O. Bond properties: bond orders, bond lengths.	1. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3 rd Edition, Pearson India, 2008 2. A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3 rd Edition, Pearson India ,2002	18	Chalk and Talk	SB
	Metallic Bond Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids.		5	Chalk and Talk	SB
	Weak Chemical Forces Hydrogen bonding (theories of hydrogen bonding, valence bond treatment), receptor-guest interactions, Halogenbonds. Effects of chemical force, melting and boiling points.		5	Chalk and Talk	SG
Module : II (Acids and bases)	Acid-Base concept Arrhenius concept, theory of solvent system (in H ₂ O, NH ₃ , SO ₂ and HF), Bronsted-Lowry's concept, Lux Floodconcept, Lewis concept, group characteristics of Lewis acids, solvent levelling and differentiating effects. Relative strength of acids, Pauling's rules. HSAB principle.	1. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3 rd Edition, Pearson India, 2008 2. A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3 rd Edition, Pearson India ,2002	6	Chalk and Talk	SG
	Acid-base equilibria in aqueous solution: Proton transfer equilibria in water, pH, buffer. Acid-base neutralization curves; indicator, choice of indicators.		6	Chalk and Talk	SG
Module : III (Radioactivity)	Nuclear stability: Nuclear stability and nuclear binding energy. Nuclear Reactions: Artificial radioactivity, fission, fusion and spallation. Radiocarbon dating	A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3 rd Edition, Pearson India ,2002	5	Chalk and Talk	SG
		Total	45		

LESSON PLAN: Semester-5 (Under CCF) 2025

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – I (CHEM-MD CC4-5 (MN-4))

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	Complexometric Titration 1. Ca(II) and Mg(II) in a mixture 2. Hardness of water 3. Fe(III) and Al(III) in a mixture 4. Cu(II) and Zn(II) in a mixture 5. Cu(II) and Ni(II) in a mixture	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	28	Chalk and Talk and Hand on Demonstration	(SB)
	Practice		2		
		Total	30		

LESSON PLAN: Semester-5 (Under CCF)2025

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-MD-CC6-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I Stereochemistry – IV	Conformation-II Concept of dihedral angle, torsion angle; energy barrier of rotation, concept of torsional and steric strains; relative stability of conformers on the basis of steric effect, dipole-dipole interaction and H-bonding; butane gauche interaction; conformational analysis of ethane, propane, <i>n</i> -butane, and 2-methylbutane; 1,2-dihaloalkanes and ethyleneglycol.	Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020	4	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	
	Concept of prostereoisomerism Prostereogenic centre; concept of (pro)chirality: topicity of ligands and faces (elementary idea); pro-R/pro-S, pro-E/pro-Z and Re/Si descriptors; pro- <i>r</i> and pro- <i>s</i> descriptors of ligands on propseudoasymmetric centre.		4		
	Chirality arising out of stereoaxis Stereoisomerism of substituted cumulenes with even and odd number of double bonds; chiral axis in allenes, and biphenyls; related configurational descriptors (<i>Ra/Sa</i>); atropisomerism; racemisation of chiral biphenyls		4		

LESSON PLAN: Semester-5 (Under CCF)2025

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-MD-CC6-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : II Chemistry of carbonyl Compounds	Nucleophilic Addition to C=O Structure and reactivity of carbonyl compounds; mechanism (with evidence), reactivity, equilibrium and kinetic control; formation of hydrates, cyanohydrins and bisulphite adduct; nucleophilic addition-elimination reactions with alcohols, thiols and nitrogen-based nucleophiles; reactions: benzoin condensation, Cannizzaro and Tishchenko reactions, reactions with ylides: Wittig and Corey-Chaykovsky reaction; Rupe rearrangement, oxidations and reductions: Clemmensen, Wolff-Kishner, LiAlH_4 , NaBH_4 , MPVO redox equilibrium, acyloin condensation; oxidation of alcohols with PDC and PCC; periodic acid and lead tetraacetate oxidation of 1,2-diols.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition, Pearson Education, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003. 3. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition (Pearson Education), 2010	10	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	
	Exploitation of acidity of α-H of C=O Formation of enols and enolates; kinetic and thermodynamic enolates; reactions (mechanism with evidence); halogenation of	1. Finar, I. L. Organic Chemistry	10		

LESSON PLAN: Semester-5 (Under CCF)2025

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-MD-CC6-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	carbonyl compounds under acidic and basic conditions, Hell-Volhard-Zelinsky (H. V. Z.) reaction, nitrosation, SeO ₂ (Riley) oxidation; condensations (mechanism with evidence): Aldol, Tollens', Knoevenagel, Claisen-Schmidt, Claisen ester including Dieckmann; Mannich reaction, Perkin reaction; alkylation of active methylene compounds; synthetic applications of diethyl malonate and ethyl acetoacetate; specific enolequivalents (lithium enolates, enamines and silyl enol ethers) in connection with alkylation, acylation and aldol type reaction	(Volume 1), 6th Edition, Pearson Education, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003.			
	Nucleophilic addition to α, β-unsaturated carbonyl system General principle and mechanism (with evidence); direct and conjugate addition, addition of enolates (Michael reaction), Robinson annulations reaction. Substitution at sp² carbon (C=O system) Mechanism (with evidence): BAC2, AAC2, AAC1, AAL1 (in connection to acid and ester); acid derivatives: amides, anhydrides & acyl halides (formation and hydrolysis including comparison).	3. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition (Pearson Education), 2010	8		

LESSON PLAN: Semester-5 (Under CCF)2025

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-MD-CC6-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Organometallics Grignard reagents ,Organolithiums; Gilman cuprates: preparation and reactions (mechanism with evidence); additionof Grignard and organolithium to carbonyl compounds; substitution on -COX; directed <i>ortho</i> metalation of arenesusing organolithiums, conjugate addition by Gilman cuprates;Corey-House synthesis; abnormal behaviour ofGrignard reagents; comparison of reactivity among Grignard, organolithiums and organocopper reagents;Reformatsky reaction; concept of umpolung.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson Education , 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education,2003. 3. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition(Pearson Education), 2010	5	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	
		Total	45		

LESSON PLAN: Semester-5 (Under CCF)2025

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-MD-CC6-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	Qualitative analysis of single solid organic compound: 1. Detection of special elements (N, S, Cl) by Lassaigne's test 2. Solubility and classification (solvents: H ₂ O, 5% HCl, 5% NaOH and 5% NaHCO ₃) 3. Detection of the following functional groups by systematic chemical tests: aromatic amino (Ar-NH ₂), aromatic nitro (-NO ₂), amido (-CONH ₂ , including imide), phenolic -OH, carboxylic acid (-COOH), carbonyl (distinction between -CHO and >C=O); only one test for each functional group is to be reported. Each student, during laboratory session, is required to carry out qualitative chemical tests for all the special elements and the functional groups in known and unknown (at least six) organic compounds.	1 .Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015 2. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical Organic Chemistry ,5th Edition , Pearson India, 2003	28	Chalk and Talk and Hand on Demonstration	
	Practice		2		
		Total	30		

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry MDC– VII (CHEM-MD-CC7-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Transport processes and Liquid State: Viscosity General features of fluid flow (streamline flow and turbulent flow); Newton's equation, viscosity coefficient; Poiseuille's equation; principle of determination of viscosity coefficient of liquids by fallingsphere method and using Ostwald's viscometer. Temperature variation of viscosity of liquids and comparison with that of gases. Relation between viscosity coefficient of a gas and mean free path.	Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011	5	Chalk and Talk	(IS)
	Surface tension and energy Surface tension, surface energy, excess pressure, capillary rise and surface tension; Work of cohesion and adhesion, spreading of liquid over other surface; Temperature dependence of surface tension		4	Chalk and Talk	(AS)
Module : II	Solid State Bravais Lattice and Laws of Crystallography Types of solid, Bragg's law of diffraction; Laws of crystallography (Haüy's law and Steno's law); Permissible symmetry axes in crystals; Lattice, space lattice, unit cell, crystal planes, Bravais lattice. Packing of uniform hard sphere, close packed arrangements (fcc and hcp); Tetrahedral and octahedral voids. Void space in cubic systems.	Castellan, G. W. Physical Chemistry, Narosa, 2004	6	Chalk and Talk and supplied study material	(AS)
	Crystal planes Distance between consecutive planes [cubic and orthorhombic		6	Chalk and Talk	(AS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry MDC– VII (CHEM-MD-CC7-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	lattices]; Indexing of planes, Miller indices; calculation of dhkl; Relation between molar mass and unit cell dimension for cubic system; Bragg's law . Determination of crystal structure: Structure of NaCl and KCl crystals.				
Module : III	Application of Thermodynamics – II: Colligative properties Vapour pressure of solution; Ideal solution, ideally dilute solution and colligative properties; Raoult's law. Thermodynamic derivations (using chemical potential) relating (i) Elevation of boiling point of an ideally dilute solution containing a non-volatile nonelectrolyte solute, (ii) Depression of freezing point of an ideally dilute solution containing a non-volatile nonelectrolyte solute (iii) Osmotic pressure of an ideally dilute solution containing a non-volatile nonelectrolyte solute with the molality / molar concentration of solute in solution. Applications in calculating molar masses of normal, dissociated and associated solutes in solution; Abnormal colligative properties	Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	8	Chalk and Talk	(IS)
	Phase Equilibrium		8	Chalk and Talk	(IS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry MDC- VII (CHEM-MD-CC7-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Definitions of phase, component and degrees of freedom; Phase rule and its derivations; Definition of phase diagram; Phase diagram for water, CO ₂ , Sulphur. First order phase transition and Clapeyron equation; Clausius-Clapeyron equation - derivation and use; Binary solutions: Liquid vapour equilibrium for two component systems. Ideal solution at fixed temperature and pressure; Lever Rule. Principle of fractional distillation; Duhem-Margules equation; Henry's law; Konowaloff's rule; Positive and negative deviations from ideal behaviour; Azeotropic solution; Liquid-liquid phase diagram using phenol- water system; Solid-liquid phase diagram; Eutectic mixture				
	ELECTROCHEMISTRY-II Electromotive Force Rules of oxidation/reduction of ions based on half-cell potentials; Chemical cells, reversible and irreversible cells with examples; Electromotive force of a cell and its measurement, Nernst equation;	Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford	8	Chalk and Talk and supplied study material	(AS)

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry MDC– VII (CHEM-MD-CC7-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Standard electrode (reduction) potential and its application to different kinds of half-cells. Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using glass electrodes. Concentration cells with and without transference, liquid junction potential; Potentiometric Titration.	University Press, 2018			
		Total	45		

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry MDC- VII (CHEM-MD-CC7-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Practical	Physical Chemistry Practical: 1. Surface tension measurements using Stalagmometer: a) Determine the surface tension of a given solution by drop weight method using a stalagmometer. b) Study the variation of surface tension of acetic acid solutions with concentration and hence determine graphically the concentration of an unknown solution of acetic acid. 2. Viscosity measurement using Ostwald's viscometer: a) Determination of viscosity of aqueous solutions of (i) polymer (ii) ethanol and (iii) sugar at room temperature. b) Study the variation of viscosity of sucrose solution with the concentration of solute and hence determine graphically the concentration of an unknown solution. 3. Solubility Product: a) Determination of solubility and solubility product of a sparingly soluble salt in water, and in various electrolytic media by titrimetric method. b) Determination of the activity solubility product of KHTa from the variation of concentrated solubility product with the ionic strength of the solution	Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015		Chalk and Talk and Hand on Demonstration	AS/IS

Subject Name/Code: Chemistry MDC/ CHEM-MDC

LESSON PLAN: Semester-V (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr. Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: Chemistry MDC– VII (CHEM-MD-CC7-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
		Total	30		

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I(CHEM-MD-CC3-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Aromatic Substitution: Electrophilic aromatic substitution Mechanisms and evidences in favour of it including PKIE; orientation and reactivity; reactions: nitration, nitrosation, sulfonation, halogenation, Friedel-Crafts reaction; one-carbonelectrophiles (reactions: chloromethylation, Houben-Hoesch, Vilsmeier-Haack, Reimer-Tiemann, Kolbe-Schmidt); <i>Ips</i> o substitution. Nucleophilic aromatic substitution Addition-elimination mechanism and evidences in favour of it; SN1 mechanism; <i>cine</i> substitution (benzyne mechanism), structure of benzyne. Birch Reduction of benzenoid aromatics Benzene, Alkylbenzene, Anisole, Benzoic acid (with mechanism). General Treatment of Reaction Mechanism –II Concept of organic acids and bases Concept of pK _a and pK _a H, effect of structure, substituent and solvent on acidity and basicity; proton sponge. Tautomerism Basic difference between tautomerism and resonance, prototropy (keto-enol, phenol-keto); 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, basic ideas about valence tautomerism and ring-chain tautomerism.	1. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 2. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	20	Chalk and Talk	(PR)

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I(CHEM-MD-CC3-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : II	Stereochemistry –III Conformation-I Basic idea of conformation. Conformational Nomenclature (Newman & Sawhorse): eclipsed, staggered, gauche, syn and anti; Special reference to preferred geometry for β-elimination. Relative stability of conformers on the basis of steric effect: butane-gauche interaction. Substitution and Elimination Reactions: Nucleophilic substitution reactions Substitution at sp^3 centre [systems: alkyl halides, allyl halides, benzyl halides, alcohols, ethers, epoxides, α-halocarbonyls]: mechanisms (with evidence), relative rates & stereochemical features: SN_1, SN_2, SN_2', SN_1' (allylic rearrangement) and SN_i; effects of solvent, substrate structure, leaving group and nucleophiles (including ambident nucleophiles, cyanide & nitrite); substitutions involving NGP (with heteroatoms and phenyl groups). Elimination reactions E_1, E_2, E_1cB and E_i (pyrolytic <i>syn</i> eliminations); formation of alkenes and alkynes; mechanisms (with evidence), reactivity, regioselectivity (Saytzeff/Hofmann) and stereoselectivity; comparison between substitution and elimination reactions, comparison between nucleophilicity and basicity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition, Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 4. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	13	Chalk and Talk	(PR)

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I(CHEM-MD-CC3-5)

Unit / Group / Module / Article	Planned			After Implementation	
	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : III	Chemistry of alkenes and alkynes 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, <i>syn</i> and <i>anti</i> -hydroxylation, ozonolysis, addition of singlet and triplet carbenes; Simmons-Smith cyclopropanation reaction; electrophilic addition to 1,3-butadiene; concept of kinetic and thermodynamic control of products; radical addition: HBr addition; mechanism of allylic and benzylic bromination in competition with brominations across C=C; use of NBS; interconversion of <i>E</i> and <i>Z</i> alkenes. Addition to C≡C (in comparison to C=C) Mechanism, reactivity, regioselectivity (Markownikoff and anti-Markownikoff addition) and stereoselectivity; reactions: hydrogenation, Hg (II) ion catalysed hydration, hydroboration-oxidation, dissolving metal reduction of alkynes (Birch); reactions of terminal alkynes by exploring its acidity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition, Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020 4. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson Education, 2010	12	Chalk and Talk	(PR)
		Total	45		
Practical	Identification of Pure Single organic Compound. Solid compounds Oxalic acid, tartaric acid, citric acid, succinic acid, resorcinol, urea, glucose, cane sugar, benzoic acid and salicylic acid Liquid Compounds: Formic acid, acetic acid, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde and nitrobenzene	1. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical Organic Chemistry, 5th Edition, Pearson India, 2003 2. Practical Workbook Chemistry (Honours),	26	Chalk and Talk and Hand on Demonstration	(PR)

LESSON PLAN: Semester-5 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I(CHEM-MD-CC3-5)

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Practice	UGBOS, Chemistry, University of Calcutta, 2015	4		
		Total	30		

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Soumavo Ghosh(SG),
Dr Ishita Saha (IS)

Paper Name & Code: Skill Enhancement Course (Chemistry In Daily Life) CHEM-MD-SEC-Th

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Dairy Products	Edward Cox Henry, The Chemical analysis of Foods , Hardcover, Hassell Street Press , 2021	5	Chalk and Talk	(SB)
	Food additives, adulterants, and contaminants		5	Chalk and Talk	(SB)
	Artificial food colorants		5	Chalk and Talk	(SB)
Module : II	Vitamins	B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)	5	Chalk and Talk	(AS)
	Oils and fats		5	Chalk and Talk	(AS)
	Soaps & Detergents		5	Chalk and Talk	(AS)
Module : III	Chemical and Renewable Energy Sources	Fred Billmeyer : Textbook of polymer science; Wiley 3rd edition.	5	Chalk and Talk	(IS)
	Polymers		10	Chalk and Talk	(IS)
		Total	45		
Tutorial	1. Estimation of Vitamin C		4	Chalk and Talk	(SG)
	2. Determination of Iodine number of oil.		3	Chalk and Talk	(SG)
	3. Determination of saponification number of oil.		4	Chalk and Talk	(SG)
	4. Determination of methyl alcohol in alcoholic beverages.		4	Chalk and Talk	(SG)
		Total	15		

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

**Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Soumavo Ghosh(SG),
Dr Ishita Saha (IS)**

Paper Name & Code: Skill Enhancement Course (Chemistry In Daily Life) CHEM-MD-SEC-Th

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta(AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh(SG)

Paper Name & Code: Skill Enhancement Course (Chemistry In Daily Life) CHEM-MD-SEC-Th

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Dairy Products	Edward Cox Henry, The Chemical analysis of Foods , Hardcover, Hassell Street Press , 2021	5	Chalk and Talk	(SB)
	Food additives, adulterants, and contaminants		5	Chalk and Talk	(SB)
	Artificial food colorants		5	Chalk and Talk	(SB)
Module : II	Vitamins	B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)	5	Chalk and Talk	(AS)
	Oils and fats		5	Chalk and Talk	(AS)
	Soaps & Detergents		5	Chalk and Talk	(AS)
Module : III	Chemical and Renewable Energy Sources	Fred Billmeyer : Textbook of polymer science; Wiley 3rd edition.	5	Chalk and Talk	(IS)
	Polymers		10	Chalk and Talk	(IS)
		Total	45		
Tutorial	1. Estimation of Vitamin C		4	Chalk and Talk	(SG)
	2. Determination of Iodine number of oil.		3	Chalk and Talk	(SG)
	3. Determination of saponification number of oil.		4	Chalk and Talk	(SG)
	4. Determination of methyl alcohol in alcoholic beverages.		4	Chalk and Talk	(SG)
		Total	15		

LESSON PLAN: Semester-1 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta(AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh(SG)

Paper Name & Code: Skill Enhancement Course (Chemistry In Daily Life) CHEM-MD-SEC-Th

LESSON PLAN: Semester-1 (Under CCF)2025

Department Name:Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS),

Paper Name & Code: Skill Enhancement Course (Chemistry In Daily Life) CHEM-MD-IDC-Th

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Dairy Products	Edward Cox Henry, The Chemical analysis of Foods , Hardcover, Hassell Street Press ,2021	5	Chalk and Talk	(SB)
	Food additives, adulterants, and contaminants		5	Chalk and Talk	(SB)
	Artificial food colorants		5	Chalk and Talk	(SB)
Module : II	Vitamins	B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)	5	Chalk and Talk	(PR)
	Oils and fats		5	Chalk and Talk	(PR)
	Soaps & Detergents		5	Chalk and Talk	(PR)
Module : III	Chemical and Renewable Energy Sources	Fred Billmeyer : Textbook of polymer science; Wiley 3rd edition.	5	Chalk and Talk	(IS)
	Polymers		10	Chalk and Talk	(IS)
		Total	45		
Tutorial	1. Estimation of Vitamin C		4	Chalk and Talk	(SB)
	2. Determination of Iodine number of oil.		3	Chalk and Talk	(IS)
	3. Determination of saponification number of oil.		4	Chalk and Talk	(PR)
	4. Determination of methyl alcohol in alcoholic beverages.		4	Chalk and Talk	(IS)
		Total	15		

LESSON PLAN: Semester-1 (Under CCF)2025

Department Name:Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS),

Paper Name & Code: Skill Enhancement Course (Chemistry In Daily Life) CHEM-MD-IDC-Th

Planned				After Implementation	
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : I	Dairy Products	Edward Cox Henry, The Chemical analysis of Foods , Hardcover, Hassell Street Press ,2021	5	Chalk and Talk	(SB)
	Food additives, adulterants, and contaminants		5	Chalk and Talk	(SB)
	Artificial food colorants		5	Chalk and Talk	(SB)
Module : II	Vitamins	B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)	5	Chalk and Talk	(PR)
	Oils and fats		5	Chalk and Talk	(PR)
	Soaps & Detergents		5	Chalk and Talk	(PR)
Module : III	Chemical and Renewable Energy Sources	Fred Billmeyer : Textbook of polymer science; Wiley 3rd edition.	5	Chalk and Talk	(IS)
	Polymers		10	Chalk and Talk	(IS)
		Total	45		
Tutorial	1. Estimation of Vitamin C		4	Chalk and Talk	(SB)
	2. Determination of Iodine number of oil.		3	Chalk and Talk	(IS)
	3. Determination of saponification number of oil.		4	Chalk and Talk	(PR)
	4. Determination of methyl alcohol in alcoholic beverages.		4	Chalk and Talk	(IS)
		Total	15		