DEPARTMENT OF CHEMISTRY

Honours	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Part 1 (Sem 1) Core T1, Core P1	July	10	8	Valence Bond Theory, Electronic displacements	Separation based upon solubility
	August	17	16	MO theory, Physical properties of molecules, Reaction Mechanism	Purification of the separated components
	September	11	10	Reactive intermediates, Stereochemistry-Bonding geometries of carbon compounds	Determination of melting pointof the separated components
	October	6	10	Concept of chirality and symmetry	Determination of boiling point of common organic liquid compounds
	November	8	8	Relative and absolute configuration	Identification of a Pure Organic Compound- Solid
	December	8	8	Optical activity of chiral compounds	Identification of a Pure Organic Compound-Liquid
Part 1 (Sem 1) Core T2, Core P2	July	11	8	Kinetic Theory of gases, Maxwell distribution of speed and energy	Determination of pH of unknown solution (buffer), by color matching method
	August	16	18	Real gas and virial equation, Zeroth and 1st law of Thermodynamics	Determination of heat of neutralization of a strong acid by a strong base
	September	10	8	Thermochemistry,Second Law of Thermodynamics	Study of kinetics of acid-catalyzed hydrolysis of methyl acetate
	October	7	8	Thermodynamic relations, Rate law, order and molecularity	Study of kinetics of decomposition of H2O2
	November	9	10	Role of temperature and theories of reaction rate	Determination of heat of solution of oxalic acid from solubility measurement
	December	7	8	Homogeneous catalysis	Revision
Part 1 (Sem 2) Core T3, Core P3	January	11	10	Extra nuclear Structure of atom	Estimation of carbonate and hydroxide present together in Mixture, Estimation of carbonate and bicarbonate present together in a mixture.
	February	14	14	Quantum numbers and their significance, Ground state Term symbols of atoms and ions for atomic number upto 30	Estimation of free alkali present in different soaps/detergents, Estimation of Fe(II) using standardized KMnO4 solution
	March	13	12	Chemical periodicity	Estimation of oxalic acid and sodium oxalate in a given mixture
	April	10	10	Acid-Base reactions	Estimation of Fe(II) and Fe(III) in a given mixture using $K_2Cr_2O_7$solution,

					Estimation of Fe(III) and Cu(II) in a mixture using $K_2Cr_2O_7$.
	May	7	8	Redox Reactions	Estimation of Fe(III) and Mn(II) in a mixture usingstandardized $KMnO_4$ solution
	June	5	6	Precipitation reactions	Estimation of Fe(III) and Cr(III) in a mixture using $K_2Cr_2O_7$
Core T4, Core P4	January	10	12	Chirality arising out of stereoaxis, Concept of prostereoisomerism	Organic Preparations noting the yield of the crude product, purification and determination of melting point-Nitration of aromatic compounds, Condensation reactions
	February	15	12	Conformational nomenclature, Reaction thermodynamics,Concept of organic acids and bases	Hydrolysis of amides/imides/esters. Acetylation of phenols/aromatic amines
	March	9	10	Tautomerism, Reaction kinetics	Benzoylation of phenols/aromatic amines, Side chain oxidation of aromatic compounds
	April	11	10	Free-radical substitution reaction	Diazo coupling reactions of aromatic amines, Bromination of anilides using green approach, Redox reaction including solid-phase method
	May	8	10	Nucleophilic substitution reactions	Green 'multi-component-coupling' reaction
	June	7	6	Elimination reactions	Selective reduction of m-dinitrobenzene to m-nitroaniline

General	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Semester 1 DSC 2A, DSC 2A Lab CEMGCOR01T, CEMGCOR01P	July	10	8	Atomic Structure: Bohr's theoryatomic spectra, Sommerfield's model, quantum numbers,Pauli's Exclusion Principle, Hund's Rule, *Aufbau* Principle, Electronic Displacement: Inductive, Resonance , hyperconjugative effects,Homolytic , heterolytic cleavages, Reactive intermediates.	Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture, Detection of extra elements (N, Cl,S) in organic compounds
	August	17	16	**Chemical Periodicity**:Classification of elements on the basis of electronic	Estimation of oxalic acid by titrating it with $KMnO_4$, Solubility and

				Configuration:General characteristics of s-, p- d- and f- block elements, position of hydrogen and noble gases, **Stereochemistry**:Different types of isomerism, geometrical and optical isomerism, concept of chirality and optical activity, elements of symmetry,Interconversion of Fischer and Newmann projection.	Classification, Detection of $–NO_2$, NH_2, -COOH
	September	11	10	Atomic and ionic radii, ionization potential, electron affinity, and electronegativity; periodic and group-wise variation of above properties. enantiomerism and diastereomerism, *meso* compounds; *threo* and *erythro*, D and L, *cis* and *trans* nomenclature; CIP Rules: R/S (upto 2 chiral carbon atoms) and E/Z nomenclature.	Estimation of water of crystallization in Mohr salt by titrating with $KMnO_4$, Detection of Carbonyl and Phenolic OH Group in solid organic Compounds.
	October	6	10	**Acids and Bases:**Brönsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases, effects of substituent and solvent, differentiating and levelling solvents. ***Nucleophilic substitutions*:** S_N1 and S_N2 reactions; eliminations: E1 and E2 reactions (elementary mechanistic aspects); Saytzeff and Hofmann eliminations;elimination *vs* substitution	Estimation of Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator, Identification of unknown solid organic compounds.
	November	8	8	Lewis acid-base concept, classification of Lewis acids and bases Lux-Flood concept and solvent system concept. Hard and soft acids and bases (HSAB concept), applications of HSAB process. Alkanes(up to 5 carbon atoms): *Preparation:* catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* mechanism for free radical substitution Alkenes (up to 5 carbon atoms): *Preparation:* elimination reactions: dehydration of alcohols and dehydrohalogenation of alkyl halides; *cis*	Estimation of Cu (II) ions iodometrically using $Na_2S_2O_3$, Identification of unknown solid organic compounds.

				alkenes (partial catalytic hydrogenation) and *trans* alkenes (Birch reduction). *Reactions: cis*-addition (alkaline KMnO4) and *trans*-addition (bromine) with mechanism, addition of HX [Markownikoff's (with mechanism) and antiMarkownikoff's addition]	
	December	8	8	Balancing of equations by oxidation number and ion –electron ethod Alkenes (up to 5 carbon atoms): hydration, ozonolysis, oxymercuration-demercuration and hydroboration-oxidation reaction. *Alkynes:* (up to 5 Carbons). *Preparation:* acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal dihalides. *Reactions:* formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation with hot alkaline KMnO4.	Identification of unknown solid organic compounds.
Semester 2 DSC 2B, DSC 2B Lab CEMGCOR02T, CEMGCOR02P	January	11	12	Ionic bonding, Kinetic Theory of Gases and Real gases	Surface tension measurement
	February	14	12	Covalent Bonding, Surface tension, viscosity	Viscosity measurement
	March	13	10	Concept of resonance in various inorganic and organic compound, Forms of solids, crystal systems, unit cells	Acid hydrolysis of methyl acetate with hydrochloric acid, Compare the strengths of HCl and H_2SO_4
	April	10	10	MO approach: Rules for the LCAO method,bonding and antibonding MOs and their charaxteristics,MO treatment of Homonuclear and heteronuclear diatomic molecules(CO, NO, NO^+), Chemical Kinetics	Qualitative semimicro analysis of mixtures containing three radicals
	May	7	10	Comparative study of p-block elements	Qualitative analysis
	June	5	6	Comparative study of p-block elements	Qualitative analysis

Honours	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Part II (Sem III) Core T5, Core P5	July	10	8	Fick's law, Viscosity	Study of viscosity of unknown liquid
	August	17	16	Conductance and transport number, Partial properties and Chemical potential, Chemical Equilibrium	Determination of partition coefficient
	September	11	10	Chemical potential and other properties of ideal substances	Determination of Keq for $KI+I_2=KI_3$
	October	6	10	Beginning of Quantum Mechanics	Conductometric titration of an acid against strong base
	November	8	8	Wave function, Concept of Operators	Study of saponification reaction conductometrically
	December	8	8	Particle in a box, Simple Harmonic Oscillator	Verification of Ostwal's dilution law
Part II (Sem III) Core T6, Core P6	July	11	8	Ionic bond: General characteristics	Estimation of Cu(II)
	August	16	18	Covalent bond, Fazan's rules	Estimation of Vitamin C, Estimation of (i) arsenite and (ii) antimony iodimetrically
	September	10	8	Molecular orbital concept of bonding	Estimation of available chlorine in bleaching powder
	October	7	8	Metallic Bond, Semiconductors and insulators, defects in solids	Determination of heat of solution of oxalic acid from solubility measurement
	November	9	10	Weak Chemical Forces, Effects of chemical force, melting and boiling points	Estimation of Cu in brass, Estimation of Cr and Mn in Steel
	December	7	8	Radioactivity	Estimation of Fe in cement
Part II (Sem III) Core T7, Core P7	July	13	9	Chemistry of alkenes and alkynes: Addition to C=C, Addition to C≡C	Detection of special elements (N, S, Cl, Br) by Lassaigne"s test
	August	14	16	Aromatic Substitution: Electrophilic aromatic substitution, Nucleophilic aromatic substitution	Solubility and classification
	September	8	11	Carbonyl and Related Compounds: Exploitation of acidity of α-H of C=O	Detection of the functional groups
	October	7	6	Elementary ideas of Green Chemistry	Melting point of the given compound
	November	11	9	Nucleophilic addition to α,β-unsaturated carbonyl system, Substitution at sp^2 carbon	Preparation, purification and melting point determination
	December	7	9	Organometallics	Identification of the compound through literature survey

Part II (Sem IV) Core T8, Core P8	January	11	10	Colligative properties, Phase rule	Determination of solubility of sparingly soluble salt
	February	14	14	Binary solutions, Ionic equilibria	Potentiometric titration of Mohr‟s salt
	March	13	12	Electromotive Force, Dipole moment and polarizability	Determination of Ksp for AgCl
	April	10	10	Qualitative treatment of hydrogen atom and hydrogen-like ions	Effect of ionic strength on the rate of Persulphate – Iodide reaction
	May	7	8	LCAO and HF-SCF	Study of phenol-water phase diagram
	June	5	6	Angular momentum	pH-metric titration of acid
Core T9, Core P9	January	10	12	General Principles of Metallurgy	Complexometric titration
	February	15	12	Chemistry of *s* and *p* Block Elements	Complexometric titration: Zn(II) in a Zn(II) and Cu(II) mixture
	March	9	10	Noble Gases	Complexometric titration: Ca(II) and Mg(II) in a mixture
	April	11	10	Inorganic Polymers	Complexometric titration: Hardness of water
	May	8	10	Coordination Chemistry	Inorganic preparations
	June	7	6	Coordination Chemistry	Inorganic preparations
Core T10, Core P10	January	12	11	Nitrogen compounds	Estimation of glycine, glucose, sucrose
	February	13	13	Rearrangements	Estimation of vitamin-C
	March	15	14	UV Spectroscopy	Estimation of aromatic amine and phenol
	April	9	9	IR Spectroscopy	Estimation of formaldehyde and acetic acid
	May	6	7	NMR Spectroscopy	Estimation of urea
	June	5	6	The Logic of Organic Synthesis	Estimation of saponification value

General	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Semester III	July	10	8	Chemical Energetics: Intensive and extensive variables, Standard states, Statement of the second law of thermodynamics	Determination of heat capacity of calorimeter for different volumes
	August	20	16	Chemical Equilibrium, Ionic Equilibria	Determination of enthalpy of ionization of acetic acid, Determination of enthalpy of neutralization, Identification of a pure solid organic compound

	September	8	10	Aromatic Hydrocarbons, Organometallic Compounds	Determination of enthalpy of hydration of copper sulphate, Identification of a pure liquid organic compound
	October	6	10	Aryl Halides	Study of the solubility of benzoic acid in water
	November	8	8	Alcohols, Phenols and Ethers	Measurement of pH of different solutions
	December	8	8	Carbonyl Compounds	Preparation of buffer solutions
Semester IV	January	11	12	Solutions	Distribution Law
	February	14	12	Phase Equilibria, Conductance	Phase equilibria
	March	13	10	Gravimetric analysis, Environmental Chemistry	Determination of dissociation constant of a weak acid
	April	10	10	Volumetric analysis	Conductometric titrations, Total hardness of water by EDTA titrations
	May	7	10	Chromatography	Potentiometric titrations, Determination of rate constant for the acid catalysed hydrolysis of an ester
	June	5	6	Electromotive force	Potentiometric titrations, determination of the strength of the H_2O_2 sample,Determination of the solubility of a sparingly soluble salt(KHTa)

SKILL ENHANCEMENT COURSE (3rd AND 4TH SEM)

	Month	**No of lectures**		**Topic**	
		Theory	**Practical**	**Theory**	**Practical**
Semester 3	July	5	5	Introduction to Analytical Chemistry and its interdisciplinary nature	Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration, Determination of pH, acidity and alkalinity of a water sample.
	August	6	6	Analysis of soil, Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents	Identification of adulterants in some common food items like coffee powder, chilli powder, turmeric powder

	September	4	4	Analysis of food products, Nutritional value of foods	Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+}, Analysis of deodorants and antiperspirants
	October	4	4	Idea about food processing and food preservations, adulteration	Determination of ion exchange capacity of anion / cation exchange resin
	November	6	6	General introduction on principles of chromatography, paper chromatography, TLC	Spectrophotometric determination of Iron in Vitamin / Dietary Tablets, Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drinks
	December	5	5	Ion-exchange chromatography	Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry
Semester 4	January	5	5	*Carbohydrates:* Biological importance of carbohydrates, Metabolism, Cellular currency of energy (ATP), Glycolysis, Alcoholic and Lactic acid fermentations, Krebs cycle. Isolation and characterization of polysachharides.	Identification and estimation of Carbohydrates – qualitative and quantitative
	February	6	6	*Proteins:* Classification, biological importance; Primary and secondary and tertiary structures of proteins: α-helix and β- pleated sheets, Isolation, characterization, denaturation of proteins.	Identification and estimation of Lipids – qualitative
	March	4	4	Structure of DNA (Watson-Crick model) and RNA, Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation, Introduction to Gene therapy.	Identification and estimation of cholesterol using Liebermann- Burchard reaction
	April	4	4	*Enzymes:* Nomenclature, classification, effect of pH, temperature on enzyme activity, enzyme inhibition	Identification and estimation of Proteins – qualitative
	May	6	6	Biochemistry of disease, Composition and functions of blood, blood coagulation. Blood collection and preservation of samples. Anaemia, Regulation	Identification and estimation of protein by the Biuret reaction

	June	5	5	Collection and preservation of samples of urine, Formation of urine. Composition and estimation of constituents of normal and pathological urine.	Determination of the iodine number of oil

SEM –V (July to December)
CEMACOR11T + 11P INORGANIC CHEMISTRY- IV

Month	Topic	No. of lectures
July	**Coordination Chemistry-II:** VB description and its limitations. Elementary Crystal Field Theory: splitting of d" configurations in octahedral, square planar and tetrahedral fields, crystal field stabilization energy (CFSE) in weak and strong fields; pairing energy. Spectrochemical series. Jahn Teller distortion. Octahedral site stabilization energy *(*OSSE).	10
	Practical: Chromatography of metal ions	10
Aug	Metalligand bonding (MO concept, elementary idea), sigma- and pi-bonding in octahedral complexes (qualitative pictorial approach) and their effects on the oxidation states of transitional metals (examples). Magnetism and Colour: Orbital and spin magnetic moments.	10
	Practical:Gravimetry	20
September	Spin only moments of d" ions and their correlation with effective magnetic moments, including orbital contribution; quenching of magnetic moment: super exchange and antiferromagnetic interactions (elementary idea with examples only); d-d transitions: L-S coupling:	10

	Practical: Gravimetry	10
October-November	Qualitative Orgel diagrams for 3d' to 3d ions. Racah parameter. Selection rules for electronic spectral transitions: spectrochemical series of ligands; charge transfer spectra (elementary idea).	6
December	**Transition Elements:** General comparison of 3d, 4d and 5d elements in term of electronic configuration, oxidation states, redox properties, coordination chemistry. **Lanthanoids and Actinoids:** General Comparison on Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).	10
	Practical: Spectrphotometry	10

JULY 2020-December 2020
SEMESTER V

Honours	Month	Topic	
		Theory	**Practical**
SEM 5 Hons ***CEMACOR12T*** ***CEMACOR12P***	July	**Polynuclear hydrocarbons and their derivatives:** Synthetic methods and reactions No of Lectures:6	**Spectroscopic Analysis of Organic Compounds by assignment of peaks in ^{1}H NMR spectra** No of Lectures:10
	August	**Heterocyclic Chemistry:** Synthesis and reactivity. No of Lectures:10	**Spectroscopic Analysis of Organic Compounds by assignment of peaks in IR** Spectra No of Lectures:10
	September	**Cyclic Stereochemistry:** No of Lectures:10	TLC separation of a mixture containing 2/3 amino acids, TLC separation of a mixture of dyes (fluorescein and methylene blue) No of Lectures:10

	October	**Pericyclic Reactions:** Mechanism, stereochemistry, regioselectivity in case of Electrocyclic, Cycloaddition and Sigmatropic reactions. No of Lectures:8	Column chromatographic separation of mixture of dyes No of Lectures:10
	November	**Carbohydrates:** Monosaccharides, Disaccharides and Polysaccharides No of Lectures:14	Paper chromatographic separation of a mixture containing 2/3 amino acids No of Lectures:10
	December	**Biomolecules:** Amino acids, Peptides and Nucleic acids No of Lectures:12	Paper chromatographic separation of a mixture containing 2/3 sugars No of Lectures:10

JULY 2020-December 2020
SEMESTER V

Honours	**Month**	**Topic**	
		Theory	**Practical**
SEM 5 ***CEMADSE01T*** *CEMADSE01P*	July	Bravais Lattice and Laws of Crystallography, Crystal planes, Determination of crystal structure	Roots of equations: (e.g. volume of van der Waals gas and comparison with ideal gas, pH of a weak acid)
	August	**Statistical Thermodynamics:** Configuration, Boltzmann distribution	Roots of equations: (e.g. volume of van der Waals gas and comparison with ideal gas, pH of a weak acid)
	September	**Partition function**: molecular partition function and thermodynamic properties (U, H, S, CV, q, P);Gibbs' paradox; Ideal gas equation	Numerical differentiation (e.g., change in pressure for small change in volume of a van der Waals gas, potentiometric titrations)
	October	Specific heat of solid, Adiabatic demagnetization	Numerical differentiation (e.g., change in pressure for small change in volume of a van der Waals gas, potentiometric titrations)
	November	**Polymers**: Classification of polymers, nomenclature, Molecular forces and chemical bonding in polymers, Criteria for synthetic polymer formation;	Matrix operations (Application of Gauss-Siedel method in colourimetry)

	December	**Polymers**: Relationships between functionality, extent of reaction and degree of polymerization; Mechanism and kinetics of step growth and copolymerization; Conducting polymers	Matrix operations (Application of Gauss-Siedel method in colourimetry)
SEM 5 ***CEMADSE02T*** ***CEMADSE02P***	July	**Qualitative and quantitative aspects of analysis**	Separation of mixtures
	August	**Optical methods of analysis:** Origin of spectra, validity of Beer-Lambert‟s law, UV-Visible Spectrometry, Flame Atomic Absorption and Emission Spectrometry	Separation of mixtures
	September	**Thermal methods of analysis**	Solvent Extractions
	October	**Electroanalytical methods**	Solvent Extractions
	November	**Separation techniques:** Solvent extraction, aspects of chromatographic methods of analysis: IC, GLC, GPC, TLC	Spectrophotometry
	December	Stereoisomeric separation and analysis: Measurement of optical rotation, calculation of Enantiomeric excess (ee)/ diastereomeric excess (de) ratios and determination of enantiomeric composition using NMR, Chiral solvents and chiral shift reagents. Chiral chromatographic techniques using chiral columns (GC and HPLC).	Spectrophotometry

SEM –VI (January to June)
CEMACOR13T + 13P INORGANIC CHEMISTRY- V

Month	Topic	No. of lectures
January	**Bioinorganic Chemistry:** Elements of life: essential and beneficial elements, major, trace and ultratrace elements. Basic chemical icactions in the biological systems and the role of metal ions (specially*, K*, Mg, Ca, Fe , Cu , and Zno). Metal ion transport across biologica membrane Na K*-ion pump. Dioxygen molecule in life. Dioxygen management proteins: Haemoglobin, Myoglobin. Hemocyanine and Hemerythrin Electron transfer proteins: Cytochromes and Feiredoxins.).	12
	Practical: All test of Acid Radicals	10
February	**Bioinorganic Chemistry:** Hydrlytic enzymas: carbonate bicarbonate buffering system and carbonic anlıydrase and carboxyanhydrase A. Biological nitrogen fixation, Photosynthesis: Photosystem-I and Photosystem-II. Toxic inctal ions and thcir **eff**ects, chelation therapy (examples only). Pt and Au complexes as drugs (examples only), metal dependent diseases (examples only)	12
	Practical: All test of Basic Radicals	10
March	**Organometallic Chemistry:** Definition and classification of organometallic compounds on the basis of bond type. Concept of laplicily of organic liyancs. 18-election and 16-clection tulos (picional MO approach). Applications of 18-clectron rule to metal carbonyls, nitrosyls, cyanides. Gencral methods of preparation of mono and binuclear carbonyls of 3d scrics. Structurcs of mononuclear and binuclear carbonyls, pi-acceptor behaviour of CO, synergic effect and use of R data to explain extent of back bonding.	12
	Practical: Test for insoluble and Analysis of Unknown sample	20

April	**Organometallic Chemistry:** Zeise's salt: Preparation, structure, evidences of synergic effect. Ferrocene: Preparation and reactions (acetylation, alkylation. metallation, Mannich Condensation). Reactions of organometallic complexes: substitution, oxidative addition, reductive elimination and insertion reactions. **Catalysis by Organometallic Compounds** Study of the following industrial processes 1. Alkene hydrogenation (Wilkinson's Catalyst) 2. Hydroformylation 3. Wacker Process 4. Syntheric gasoline (Fischer Tropsch reaction) 5. Zigler-Natta catalysis for olephene polyimlerization.	12
	Practical: Analysis of Unknown sample	10
May-June	**Reaction Kinetics and Mechanism:** Introduction to inorganic reaction mechanisms. Substitution reactions in square planar complexes, Trans- effect and its application in complex syithesis, theories of trans effect. Mechanisin of nucleophilic substitution in square planar complexes. Thermodynamic and Kinetic stability. Kinetics of octahedral substitution. Ligand field effects and reaction rates, Mechanisin of substitution in octahedral complexes.	8

JAN 2021-JUNE 2021
SEMESTER VI

Honours	Month	Topic	
		Theory	**Practical**
SEM 6 ***CEMACOR14T*** ***CEMACOR14P***	Jan	Colloids, Origin of charge and stability, Coagulation and Schultz-Hardy rule, Zeta potential and Stern double layer, Tyndall effect; Electrokinetic phenomena, Micelle formation	Verification of Beer and Lambert‟s Law for KMnO4 and K2Cr2O7 solution

	Feb	Surface tension and energy: Capillary rise and surface tension; Work of cohesion and adhesion, spreading of liquid over other surface; Temperature dependence of surface tension	Verification of Beer and Lambert‟s Law for KMnO4 and K2Cr2O7 solution
	March	Rotation spectroscopy, Vibrational spectroscopy	Study of kinetics of K2S2O8 + KI reaction, spectrophotometrically
	April	Raman spectroscopy, Nuclear Magnetic Resonance (NMR) spectroscopy	Study of kinetics of K2S2O8 + KI reaction, spectrophotometrically
	May	Lambert-Beer‟s law: Characteristics of electromagnetic radiation, physical significance of absorption coefficients; Laws of photochemistry	Determination of surface tension of a liquid using Stalagmometer
	June	Photochemical Processes: Potential energy curves, Frank-Condon principle,Bond dissociation, Decay of excited states by radiative and non-radiative paths; Pre-dissociation; Fluorescence and phosphorescence, Jablonskii diagram	Determination of surface tension of a liquid using Stalagmometer

SEMESTER VI
JANUARY -JUNE

Honours	Month	Topic	
		Theory	Practical
SEM 6 *CEMADSE04T* *CEMADSE04P* (Green Chemistry)	January	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 No of Lectures:04	Preparation and characterization of nanoparticles of gold using tea leaves. No of Lectures:10
	February	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; maximum incorporation of the materials used in the process into the final products , Atom Economy, calculation of atom	Preparation of biodiesel from vegetable/ waste cooking oil. No of Lectures:10

		economy of the rearrangement, addition, substitution and elimination reactions. Prevention/ minimization of hazardous/ toxic products reducing toxicity. risk = (function) hazard × exposure; waste or pollution prevention hierarchy. Green solvents– supercritical fluids, water as a solvent for organic reactions, ionic liquids, fluorous biphasic solvent, PEG, solventless processes, immobilized solvents and how to compare greenness of solvents. No of Lectures:10	
	March	Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy. Selection of starting materials; avoidance of unnecessary derivatization – careful use of blocking/protecting groups. No of Lectures:15	Use of molecular model kit to stimulate the reaction to investigate how the atom economy can illustrate Green Chemistry. • Preparation of propene by two methods can be studied Triethylamine ion + OH- → propene + trimethylpropene + water H_2SO4/Δ 1-propanol propene + water • Other types of reactions, like addition, elimination, substitution and rearrangement should also be studied for the calculation of atom economy. **No of Lectures:10**
	April	Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis. Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD “What you don‟t have cannot harm you”, greener alternative to Bhopal Gas Tragedy (safer route to carcarbaryl) and Flixiborough accident (safer route to cyclohexanol) subdivision of ISD, minimization,	Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide. No of Lectures:10

		simplification, substitution, moderation and limitation. Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes. No of Lectures:05	
	May	Examples of Green Synthesis/ Reactions and some real world cases: 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 Diels-Alder reaction and Decarboxylation reaction 3. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine) 4. Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO_2 for precision cleaning and dry cleaning of garments. No of Lectures:08	Extraction of D-limonene from orange peel using liquid CO_2 prepared form dry ice. Mechanochemical solvent free synthesis of azomethines No of Lectures:10
	June	5. Designing of Environmentally safe marine antifoulant. 6. Rightfit pigment: synthetic azopigments to replace toxic organic and inorganic pigments. 7. An efficient, green synthesis of a compostable and widely applicable plastic (polylactic acid) made from corn. 8. Healthier Fats and oil by Green Chemistry: Enzymatic Inter esterification for production of no Trans-Fats and Oils	Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II). Photoreduction of benzophenone to benzopinacol in the presence of sunlight. No of Lectures:10

		9. Development of Fully Recyclable Carpet: Cradle to Cradle Carpeting Future Trends in Green Chemistry: Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis (C_2S_3); Green chemistry in sustainable development. No of Lectures:18	

General	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Semester V **CEMGDSE01T** **CEMGDSE01P**	July	10	10	**Introduction and history of polymeric materials:** Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers **Functionality and its importance:** Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization.	Preparation of nylon 66
	August	10	10	**Kinetics of Polymerization:** Kinetics of step growth, radical chain growth, polymerization techniques **Nature and structure of polymers:** Structure Property relationships	Preparation of nylon 66
	September	10	10	**Determination of molecular weight of polymers:** (*Mn*, *Mw*, etc) by viscometric methods, Molecular weight distribution and its significance. Polydispersity index.	Preparation of urea-formaldehyde resin
	October	10	10	**Polymer Solution:** Criteria for polymer solubility, Solubility parameter.	Preparation of urea-formaldehyde resin
	November	10	10	**Properties of Polymer**s: Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene, poly(vinyl chloride), poly(vinyl acetate).	Preparations of novalac resin

	December	10	10	**Properties of Polymer**s: Brief introduction to preparation, structure, properties and application of the following polymers: acrylic polymers, fluoropolymers, polyamides, Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers. Conducting Polymers.	Preparations of novalac resin

ACADEMIC CALENDER
JANUARY 2021-JUNE 2021
SEMESTER VI (GENERAL)

Honours	**Month**	**Topic**	
		Theory	**Practical**
SEM VI Gen ***CEMGDSE03T*** ***CEMGDSE03P***	January	**Silicate Industries:** Classification and Properties of Glass, Ceramics and Cements.	Determination of free acidity in ammonium sulphate fertilizer.
	February	**Fertilizers:** Synthesis of different types of fertilizers	Estimation of calcium in calcium ammonium nitrate fertilizer.
	March	**Surface Coatings:** Objectives and classification of surface coatings	Estimation of phosphoric acid in superphosphate fertilizer.
	April	**Batteries:** Battery Components, characteristics and their role.	Electroless metallic coatings on ceramic and plastic material.
	May	**Alloys:** Classification and properties of alloys.	Determination of composition of dolomite (by complexometric titration).
	June	**Catalysis and Chemical explosives:** General principles, properties and types of catalysts. Preparation and explosive properties in organic compounds.	1. Analysis of (Cu, Ni); (Cu, Zn) in alloy or synthetic samples. 2. Analysis of Cement.