HSNC UNIVERSITY
KISHINCHAND CHELLARAM COLLEGE
BOS IN CHEMISTRY

REVISED SYLLABUS AS PER NEP
SYLLABUS OF FYBSC CHEMISTRY

SEMESTER – I
PHYSICAL, INORGANIC AND ORGANIC CHEMISTRY

UNIT / SUB UNIT		TOPIC	LECTURES
1	1.1	Chemical Kinetics	7
	1.2	Chemical Calculations	8
2	2.1	Acid Base Theories	10
	2.2	Comparative chemistry of Main Group Elements	5
3	3.1	Classification and nomenclature of organic compounds	5
	3.2	Fundamentals of organic reaction mechanism	4
	3.3	Stereochemistry of organic compounds	6

Practical: 30L (1 Credit)

SEMESTER – II
PHYSICAL, INORGANIC AND ORGANIC CHEMISTRY

UNIT / SUB UNIT		TOPIC	LECTURES
1	1.1	Chemical Thermodynamics	7
	1.2	pH and Buffer solutions	4
	1.3	Photochemistry	4
2	2.1	Chemical Bond and Reactivity	9
	2.2	Coordination Chemistry (Part I)	6
3	3.1	Carbon-Carbon pi bonds	5
	3.2	Aromatic Hydrocarbons	10

Practical: 30L (1 Credit)

UNIT	SUB UNIT	DETAILS OF TOPIC	LEC
1		**PHYSICAL CHEMISTRY**	15
	1.1	**Chemical Kinetics:** Rate of reaction, rate constant, measurement of reaction rates, order and molecularity of reaction, integrated rate equation of first and second order reactions (with equal initial concentration of reactants). Determination of order of reaction by (a) Integration method (b) Graphical method (c) Ostwald's isolation method (d) Half time method (Numericals to be discussed and expected for examination)	9
	1.2	**Chemical Calculations:** Expressing concentration of solutions: Normality, molality, molarity, formality, mole fractions, weight ratio, volume ratio, weight to volume ratio, ppm, ppb, millimoles, milliequivalents. (Numericals to be discussed and expected for examination)	6
2		**INORGANIC CHEMISTRY**	
	2.1	**Acid Base Theories:** **Acid base concepts:** Arrhenius, Lowry- Bronsted(solid acids and bases), Lewis, Solvent-solute concepts of acid and base,HSAB concept. Applications of HSAB **Concept of neutralization titration:** using pH-metry, Volumetric analysis with special reference to calculation of titration curve involving strong acid and strong base.	9
	2.2	**Comparative chemistry of Main Group (S & P block) Elements**: Short review of periodic table, Metallic and non-metallic nature, oxidation states, electro-negativity, anomalous behaviour of second period elements, allotropy, catenation, diagonal relationship.	6

3	**ORGANIC CHEMISTRY**		
	3.1	**Classification and Nomenclature of Organic Compounds** Review of the basic rules of IUPAC nomenclature. Nomenclature of mono and bi-functional aliphatic compounds on the basis of priority order of the following classes of compounds: alkanes, alkenes, alkynes, haloalkanes, alcohols, ethers, aldehydes, ketones, carboxylic acids, carboxylic acid derivatives (acid halides, esters, anhydrides, amides), nitro compounds, nitriles and amines; including their cyclic analogues.	5
	3.2	**Fundamentals of organic reaction mechanism:** **Electronic Effects:** Inductive, electromeric, resonance and mesomeric effects, hyper-conjugation and their applications; Dipole moment; Organic acids and bases; their relative strengths. **Bond fission:** Electrophiles and Nucleophiles; Ambident Nucleophiles, Nucleophilicity and basicity; **Types (primary, secondary, tertiary, allyl, benzyl), shape and their relative stability of reactive intermediates:** Carbocations, Carbanions and Free radicals.	4
	3.3	**Stereochemistry of Organic Compounds:** **Concept of Isomerism - All type of Isomerism (structural and stereo isomerism both):** Fischer Projection, Newman and Sawhorse Projection formulae (of erythro, threoisomers of tartaric acid and 2,3 dichlorobutane) and their interconversions. Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two similar and dissimilar chiral-centres, Distereoisomers, meso structures, racemic mixture and resolution(methodsof resolution not expected).	6

PRACTICAL (SEM – I)	
UNIT	**EXPERIMENT**
Physical Chemistry	1. To determine the viscosity of given organic compound by Ostwald 's viscometer 2. To determine the rate constant for the acid hydrolysis of ester (methyl acetate)

Inorganic Chemistry	1. Gravimetric analysis
	   a) To determine the percent composition of $BaSO_4$ and NH_4Cl in the given mixture.
	   b) To determine the percent composition of ZnO and $ZnCO_3$ in the given mixture.
	2. Analysis of commercial acid sample:
	   a) HCl
	   b) CH_3COOH
	     (Volumetric method using standardized NaOH)

Organic Chemistry	Characterisation of organic compound Compounds with C, H, (O) only (4 compounds minimum)

UNIT	SUB UNIT	DETAILS OF TOPIC	LEC
1		**PHYSICAL CHEMISTRY**	
	1.1A	**Chemical Thermodynamics:** **Thermochemistry:** Heats of reactions, standard states, enthalpy of formation of molecules, enthalpy of combustion and its applications, calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, Kirchhoff's equation (Numericals to be discussed and expected for examination)	3
	1.1B	**Thermodynamics:** statement of second law of thermodynamics, concept of entropy and free energy, spontaneity and physical significance of free energy, Carnot's cycle with derivation, thermopdynamic derivation of equilibrium constant (Numericals to be discussed and expected for examination)	4
	1.3	**pH and Buffer solutions:** pH, pH scale, type of buffers, Henderson's equation (for acidic and basic buffers), Buffer action and capacity	4
	1.4	**Photochemistry** Principle, Laws of photochemistry, quantum yield and its determination, Primary and secondary reaction, reasons for high and low quantum yield, study of photochemical reactions (i) reaction of hydrogen and chlorine (ii) dissociation of hydrogen iodide. Photosensitizer and photosensitized reactions, photochemical smog, ozone depletion, concept of flash photolysis.	4
2		**INORGANIC CHEMISTRY**	
	2.1	**Chemical Bond and Reactivity** Types of chemical bond, comparison between ionic and covalent bonds, polarizability, (Fajan's Rule), shapes of molecules, Lewis dot structure, Sidgwick Powell Theory, basic VSEPR theory for AB_n type molecules with and without lone pair of electrons, isoelectronic principles, applications and limitations of VSEPR theory.	9
	2.2	**Coordination Chemistry (Part I)**	6

		a) Valence Bond Theory - Introduction, postulates, examples with geometry (ML_2 to ML_6) and limitations of VBT. b) Molecular Orbital theory- Introduction.	
3		**ORGANIC CHEMISTRY**	
	3.1	**Carbon-Carbon pi bonds** **Formation of alkenes and alkynes by elimination reactions:** Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations. **Reactions of alkenes:** Electrophilic additions their mechanisms (Markownikoff / Anti Markownikoff addition), Addition of Suphuric Acid to Alkenes Mechanism of oxymercuration - demercuration, hydroboration - oxidation, ozonolysis.	5
	3.2	**Aromatic Hydrocarbons** Aromaticity: Hückel's rule, Hammond's postulates,anti-aromaticity, aromatic character of arenes, cyclic carbocations / carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft alkylation/acylation with their mechanism. Directing effects of the groups.	10

PRACTICAL (SEM – II)	
UNIT	**EXPERIMENT**
Physical Chemistry	1. To prepare various compositions of buffer solutions of different pH using sodium acetate and acetic acid solutions and determine their pH values by using pH meter. 2. To determine concentration of given sample of $KMnO_4$ by colorimetric method (Learners are expected to determine λmax and plot calibration curve). 3. To determine enthalpy of dissolution of salt (like KNO_3)
Inorganic Chemistry	1. Oxidation reduction titration: Oxalic acid and $KMnO_4$ 2. Titration using double indicator: To determine amount of Na_2CO_3 and $NaHCO_3$ in the given solution using supplied standard HCl solution (phenolphthein and Methyl Orange indicator).
Organic Chemistry	1. Characterization of organic compound Compounds with C, H, (O) and N / S / X (4 compounds minimum). 2. Purification of any two organic compounds by recrystallization selecting suitable solvent. Yield of purification and melting point of purified product is to be reported.