SEMESTER - III Course III (ORGANICCHEMISTRY&SPECTROSCOPY) 60hrs (4 h / w)

ORGANIC CHEMISTRY 34h

UNIT – I

1. Chemistry of Halogenated Hydrocarbons: 6h Alkylhalides:Methods of preparation and properties, nucleophilic substitution reactions SN1,SN2andSNimechanismswithstereochemicalaspectsandeffectofsolventetc.;nucleophilics ubstitutionvs.elimination, Williamson’s synthesis. Arylhalides:Preparation(includingpreparationfromdiazoniumsalts)andproperties,nucleophilic aromatic substitution;SNAr,Benzynemechanism. Relativereactivityofalkyl,allyl,benzyl,vinylandarylhalidestowardsnucleophilicsubstitut ionreactions.

2. Alcohols &Phenols 6h

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, BouvaeltBlanc Reduction; Oxidationofdiolsbyperiodicacidandleadtetra acetate,PinacolPinacolonerearrangement; Phenols:Preparationandproperties;Acidityandfactorseffectingit, Ringsubstitution reactions, Reimer–Tiemannand Kolbe’s–Schmidt Reactions, Fries and Claisenrearrangements with mechanism;

UNIT-II Carbonyl Compounds 10h

Structure,reactivity,preparation and properties,Nucleophilicadditions,Nucleophilicaddition-eliminationreactionswithammoniaderivatives MechanismsofAldolandBenzoincondensation, Claisan-Schmidt, Perkin, CannizzaroandWittigreaction,Beckmannhaloformreactionand BaeyerVilligeroxidation,αsubstitutionreactions,oxidationsandreductions(Clemmensen, wolf –kishner, with LiAlH4 &NaBH4). Additionreactionsof α,β-unsaturatedcarbonylcompounds:Michaeladdition. Activemethylenecompounds: Ketoenoltautomerism.Preparationandsyntheticapplicationsofdiethyl malonateandethylacetoacetate.

UNIT-III CarboxylicAcidsand their Derivatives 12h General methods of preparation, physical properties and reactions of monocarboxylic acids, effect of substituentsonacidicstrength.Typicalreactionsofdicarboxylicacids,hydroxyacidsandunsaturat edacids. Preparationandreactionsofacidchlorides,anhydrides,estersandamides; Comparativestudyofnucleophilicsubstitutionatacylgroup-Mechanism ofacidicandalkalinehydrolysisof esters,Claisencondensation,Reformatskyreactions and Curtiusrearrangement Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, ArndtEistert synthesis, halogenation by Hell- Volhard- Zelinsky reaction.

SPECTROSCOPY 26 h

UNIT-IV MolecularSpectroscopy: 18h Interactionofelectromagneticradiationwithmoleculesandvarioustypesof spectra; Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution. Vibrationalspectroscopy: Classicalequationofvibration, computationofforceconstant, Harmonic and anharmonic oscillator, Morsepotential curve,vibrational degreesoffreedom forpolyatomic molecules, modesofvibration. Selection rules for vibrational transitions, Fundamentalfrequencies, overtones and hotbands. Electronic spectroscopy: Energy levels of molecular orbitals (σ, π, n). Selection rules for electronic spectra. Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore. bathochromic and hypsochromic shifts.Beer-Lambert’s law and its limitations. Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

UNIT-V 8h

Application of Spectroscopy to Simple Organic Molecules

Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Application of electronic spectroscopy and Woodward rules for calculating λmax of conjugated dienes and α,β – unsaturated compounds. Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions).

LABORATORY COURSE -III 30hrs (2 h / w)

Practical Course-IIIOrganic preparations and IR Spectral Analysis (At the end of Semester- III)

Organic preparations 40 M

Acetylation of one of the following compounds: amines (aniline, o-, m-, ptoluidines and o-, m-, p-anisidine) and phenols (β-naphthol, vanillin, salicylic acid) by any one method: a. Using conventional method. b. Using green approach ii. Benzolyation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine) iii. Nitration of any one of the following: 18 a. Acetanilide/nitrobenzene by conventional method b. Salicylic acid by green approach (using ceric ammonium nitrate).

IR Spectral Analysis 10M

IR Spectral Analysis of the following functional groups with examples a) Hydroxyl groups b) Carbonyl groups c) Amino groups d) Aromatic groups