M.Sc. (Industrial Chemistry) IIIrd Semester

IC 301 - SPECTROSCOPY

UNIT – I

UV-visible Spectroscopy

Photo electron spectroscopy
general theory and application of UV and X-Ray photo electron spectroscopy (UV PES and ESCA) a general idea of auger photoelectron spectroscopy, application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

UNIT – II

Infrared Spectroscopy
Theory, vibration modes, instrumentation (Dispersive and non dispersive instrument), applications and interpretation of spectra
Brief idea of Raman Spectroscopy

UNIT – III

Nuclear Magnetic Resonance Spectroscopy
Theory of NMR, Chemical Shift, Spin-spin splitting, environmental effect on NMR spectra. Instrumentation, CW or FTNMR instrument, rules governing the interpretation of H NMR spectra. Application in quantitative analysis, spectroscopy of others important nuclei. ¹⁵N, ¹⁹F, ²⁹Si, ³¹P
¹³C NMR : Historical Development, various terms used in C NMR, application of C NMR to structure determination, two dimensional NMR spectroscopy, principle, the COSY experiment, COSY (DQF) and NOESY experiment, three dimensional NMR experiment
UNIT – IV

Concept, instrumentation & use of ESR spectroscopy, ENDOR, ELDOR
NQR: Theory, Instrumentation & application of nuclear quadrupole resonance spectroscopy.

UNIT – V

Mass Spectroscopy

Massbaur (Fe & Sn)
General theory, instrumentation and important applications of Massbaur Spectroscopy.
IC 302 - UNIT OPERATIONS

UNIT – I

Distillation
Introduction; VLE, Batch and continuous distillation, Mecabe Thiele method, Reflux ratio, q-line, Azeotropic, Steam and extractive distillation.
Equipment: plate columns and packed columns.

Absorption
Introduction, Liquid gas equilibrium selection criteria for solvent minimum gas liquid ratio type of packing. Equipments – packed columns, spray columns, bubble columns, packed bubble columns, mechanically agitated contactors.

UNIT - II

Evaporation
Introduction; Equipments short tube (standard) evaporator, forced circulation evaporator, falling film evaporators, climbing film (upward flow) evaporators, wiped (agitated) film evaporators.

Heat Exchanger
Introduction; Equipments double pipe, Shell and tube, U-tube, Fine tube Heat exchanger

UNIT – III

Crystallization
Introduction: Solubility, super saturation, nucleation, crystal growth, Equipment – tank crystallizer, agitated crystallizer, evaporator crystallizer, draft tube crystallizer.

Extraction
Introduction: selection of solvents, Equipments – spray column, packed column rotating disc column, mixer settler.
UNIT – IV

Filtration

Size Reduction and size Separation
Definition, objectives of size reduction, factors affecting size reduction, Law governing energy and power requirement of mills including ball mill, hammer mill, fluid energy mill etc.

Mixing
Theory of mixing, solid – solid, solid-liquid and liquid – liquid mixing equipments

UNIT – V

Drying
Introduction; free moisture, bound moisture, drying curve, Equipments – tray drier, rotary dryer, flash dryer and spray dryer.

Ideal Reactors
Performance equation for ideal CSTR & PFR, Batch reactor, Reactor fundamentals, Constant and Variable volume Batch reactor.
UNIT - I

Polymer Rheology and Morphology
Introduction stress and strain, ideal elastic solid, Newtonian and non-newtonian fluid. Apparent viscosity the power, low molecular hole concept, weissenberg effects, rheological properties of fluid, melt fracture and irregular, time dependent flow, viscoelastic behaviour, mechanical model of a viscoelastic material relaxation enhancement under constant stress. Hysteresis, creep and relaxation of typical plastics.

Physical & mechanical testing of Polymer
Stress-strain measurement, dynamic mechanical behaviour, stress cracking, hardness, tear strength or tear resistance, resilience's, flex cracking resistance, abrasion resistance, impact resistance.

UNIT – II

Polymer processing
Compression moulding, casting, extrusion, Fiber-spinning, injection moulding, thermoforming

Polymer Products
Beltig, hoses, rubber footwear, Rubber to metal bonded components, cellular rubbers, sports goods, cables, latex products, rubber rollers, extruded and moulded products.

UNIT – III

Functions and example of compounding ingredients
(1) Activators (2) Accelerators
(3) Blowing agents (4) Softners
(5) Pigments (6) Tactifers
(7) Release agents (8) Reclaimed rubber
(9) Tactics (10) Ground crumb
(11) Mineral rubber (12) Retardecs
Fillers

Non Black Fillers: Introduction manufactures characteristics and application of calcium carbonate, clays, silica in the rubber industry.
Reinforcing and extending filler: Introduction manufactures characteristics and application of some representative fillers.

UNIT – IV

Adhesives – Solvent based, water based and adhesives based on various polymers. Epoxide resins curing of epoxide resins. Dilutents and other additives and their applications.
Composite materials, properties, advantages and methods of preparation.
Blends: Preparation, processing, properties uses and Industrial aspects.

UNIT – V

Chemical Testing
Identification of materials by; elemental and solubility analysis. Identification by colour tests. Estimation of specific chemical characteristics like; acid number, saponification value and hydroxyl value. Solvent extractions and its analysis for polymers

Analysis & Testing of Polymers
Thermal analysis: DSC, TGA, TMA, DTA
UNIT - I

Drugs acting on gastrointestinal disorders

(a) Agents for control of gastric acidity and treatment of peptic ulcers: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Ranitidine, Sodium bicarbonate, Magnesium Hydroxide, Aluminum Hydroxide Gel, Sucralfate.

(b) Emetics, Antiemetics and other Gastrointestinal drugs.

(c) Drugs for constipation and Diarrhoeas: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Bran, Ispaghula, Diphenylmethanes, Sulfasalazine, Codeine.

UNIT - II

Cardiovascular drugs

a) Cardiovascular Drugs: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Digoxin, Digitoxin, Clonidine, Hydralazine, Methyldopa, Nitroglycerine, Iosoxsupurine, Prenylamine, Disopyramide Phosphate, Procainamide Hydrochloride.

b) Hematopoietic Agents: Growth factors, minerals, anticoagulants, thrombolytic and antiplatelet drugs

UNIT - III

Drugs acting on Kidney

a) Relevant physiology of urine formation

b) Diuretics: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Chloromerodrin, Hydrochlorothiazide, Acetazolamide, Chlarthlidona, Furosemide, Spironolactone, Mallitol.

c) Antidiuretics: Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Lypressin, Amiloride, Carbamazepine.
UNIT - IV

(a) **Drugs of Arthritis & Goat:** Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Gold, d-Penicillamine, Chloroquine, Sulfasalazine, NSAIDs, Colchicine, Allopurinol.

(b) **Drugs of Cough and Bronchial Asthma:** Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Codeine, dextromethorphan, bromhexine, ambroxol, guaiphenesin, isoprenaline, salbutamol, Theophylline, Aminophylline, Atropin methonitrate, ketotifen.

(c) Treatment of drug allergies.

UNIT - V

a) **Drugs acting on skins and mucous membrane:** Demulcents (Glycerine), Emollients (Vegetable Oils), Adsorbents and protectives (Calamine, Zinc Oxide, Zinc/Magnesium stearate, Dimethicone), Astringents (Tannia acid, alcohol, minerals), Melanizing Agents, Drugs of Psoriasis (Calcipotriol), Demelanizing Agents (Hydroquinone, Monobenzone), Sunscreens, Drugs for acne vulgaris (Benzoyl peroxide, Retinoic acids, Antibiotics, Isotretinoin).

b) **Anti Fungal Drugs:** Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of amphotericin B, Ketoconazol, Griseofulvin, Itaraconazol.

c) **Antiviral Drugs:** Classification, pharmacology, mode of action, adverse effects, synthesis and structure activity relationship of Acyclovir, Amantidine hydrochloride, Zidovudine.
UNIT - I

Classification of Pesticides structure, synthesis, mode of action and application of environmental impact of following:

Insecticide of Plant Origin: Nicotine, Pyrethroids, althrin.
Fungicides: Dichlone, captan

UNIT - II

Structure, synthesis, mode of action, application & environmental impact of following:

Chlorinated hydrocarbon: BHC, heptachlor, aldrin, dieldrin, endosulfan, SAR in the class.

UNIT - III

Structure, synthesis, mode of action, application & environmental impact of following:

Organo Phosphorous insecticides: Dichlorovos, Paraoxon, SAR in the class
Dithio phosphoric acid derivatives: Malathion,
Thio phosphoric acid: Parathion, demeton, chlorthion etc.
Pyrophosphoric acid derivative: TEPP

UNIT - IV

Structure, synthesis, mode of action, application & environmental impact of following:

Carbonate insecticides: Carbaryl, baygon
Rhodenticide: Zinc Phosphide, warfarin, fluoroacetamide.

UNIT - V

Formulation of Pesticides

Dry formulations: Dusts, granules, we table powders, seed disinfectant.
Liquid formulation: Emulsions, suspensions, aerosols and sprays.
IC 304 B - PHARMACEUTICS

UNIT - I
The design of dosage forms and Preformulation

a) Design of Dosages Forms: Principles of dosage form design, biopharmaceuticals consideration in dosage form design, routes of drug administration, drugs factors in dosage form design, therapeutics consideration in dosage form design,

b) Preformulation: Concept of preformulations, Uxorious aspects of preformulations, spectroscopy, solubility, melting point, powder flow properties, assay development.

UNIT - II
Physiochemical Principles of Pharmaceutics

a) Viscosity, Rheology and the flow of fluids: Newtonian and Non-Newtonian fluids, viscosity values for Newtonian fluids, determination of the flow properties of simple fluids, types of non-Newtonian behaviour, determination of the flow properties of non-Newtonian fluids, the effects of rheological properties on bioavailability.

b) Solubility and dissolution rate: Methods of expressing solubility, prediction of solubility, solubility of liquids in liquids, solids in solids, gases in liquids and solids in liquids, dissolution rate of solids in liquids, factors affecting dissolution rates, measurement of dissolution rates

UNIT – III
a) Disperse systems: Colloids, Preparation of colloids, properties of colloids, physical stability of colloidal systems, gels, surface active agents, micellizations, solubilization, detergency.

b) Biopharmaceutics: Concept of Bioavailibility and Biopharmaceutics, factor influencing bioavailability, assement of bioavailability, representation of bioavailability data, absolute and related bioavailability, one compartment open model of drug disposition in the body. Dosage regimens and their influence on the concentration, time profile of a drug in the body.
UNIT – IV

Study of Pharmaceutical Dosages Form Design Consideration

a) Tablets: Types of tablets, tablets ingredients, diluents, binders, disintegrants, lubricants, colors, flavours, sweeteners, types of coating.

b) Tablet Standardization: Hardness, friability, weight variations, disintegration, dissolution and content uniformity tests.


UNIT – V

a) Pharmaceutical Preparations: Principles and procedures involved in the dispensing of following classes of pharmaceutical dosages form – solutions, aromatic water, syrups, elixirs, spirits, tinctures, mixtures, lotions, liniments, throat paints.

b) Suspensions: Introduction, flocculations and deflocculating, sedimentations parameters, role of wetting, suspension formulation, evaluation of suspension stability.

c) Emulsions: Introduction, types, detection, thermodynamic consideration.