

**I/II M.PHARMACY (1<sup>st</sup> Semester)**

**1.1 T : ADVANCED INSTRUMENTAL METHODS OF ANALYSIS**

- 1. UV-VISUAL SPECTROSCOPY :** Brief review of electromagnetic spectrum, UV-Visual range, energy-wavelength-color relationship. Interaction of electromagnetic radiation (UV-Vis) and matter and its effects. Chromophores and their interaction with Electromagnetic Radiation. Absorption spectra of organic compounds and complexes illustrating the phenomenon and its utilization in qualitative and quantitative analysis of drugs. Shifts and their Interpretation (including solvent effects)
  
- 2. INFRA-RED SPECTROSCOPY :** Nature of Infra-red radiation. Interaction of IR. Radiation with organic molecules and effects on bonds. Brief outline of classical I.R. instrumentation and the interpretation of spectra, including sample preparation for spectroscopy. Qualitative interpretation of I.R. spectra. Quantitative methods useful in drug analysis.
  
- 3. NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY :** Fundamental principles of NMR (Magnetic Properties of nuclei, applied field and precession; absorption and transition frequency). Chemical shifts concept; Isotopic nuclei, Reference standards; Proton Magnetic spectra, their characteristics, presentation, terms used in describing spectra and their interpretation (Signal no. Position, intensity). Brief outline of instrumental arrangements and some practical details. Signal multiplicity phenomena in high resolution PMR Spin spin coupling. Application of Signal Split and coupling constant data to interpretation of spectra. Decoupling and shift reagent methods.

**Brief outline of principles of FT-NMR with reference to <sup>13</sup>CNMR;** Spin-spin and spin-lattice relaxation phenomena. Free induction decay (FID) proton noise decoupling signal averaging time domain and frequency domain signals nuclear overhauser enhancement; <sup>13</sup>CNMR spectra, their presentation, characteristics, interpretation examples and application in drug analysis.

- 4. MASS SPECTROMETRY :** Basic principles and brief outline of instrumentation. Ion formation and types, molecular ion, meta stable ions, fragmentation processes, fragmentation patterns and fragment characteristics in relation to parent structure and functional groups. Relative abundances of isotopes and their contribution to characteristics peaks. Mass spectrum, its characteristics, presentation and interpretation. Chemical ionization mass spectrometry, GC-MS other recent advances in MS, FAST ATOM BOMBARDMENT MASS spectroscopy. Application of mass spectrometry in the analysis of drug.
- 5. GAS CHROMATOGRAPHY :** Instrumentation packed and open tubular column, column efficiency parameters, the Van Deemeter equation, Resolution, liquid stationary phases, Derivatisation methods of GC including acylation, perfluoroacylation, alkylation and esterification. Detectors; FID, ECD, TCD, NPD. A critical comparison of sensitivity, selectivity and field of application of these detectors. Examples of GC applications in Pharmaceutical Analysis.
- 6. LIQUID CHROMATOGRAPHY :** Comparison of GC and HPLC, instrumentation in HPLC, analytical, preparative and micropore columns, normal and reversed-phase packing materials, Reverse-phases HPLC, column selection, mobile phase selection, efficiency parameters, resolution, detectors in HPLC; refractive index, Photometric and electrochemical. Comparison of sensitivity, selectivity and field of applications of these detectors. HPTLC-instrumentation and applications.
- 7. X-RAY DIFFRACTION AND DSC, DTA METHODS :** Introduction, Generation of X-Rays, Elementary crystallography; miller Indices, X-ray, diffraction Bragg's law, X-ray powder diffraction, X-ray powder diffractometer, obtaining and interpretation of X-ray powder diffraction data. Applications of XRD, DSC and DTA in the characterization of Pharmaceutical solids.
- 8. RADIO IMMUNO ASSAY METHODS :**

**I/II M.PHARMACY (1<sup>st</sup> Semester)**

**1.1 P : ADVANCED INSTRUMENTAL METHODS OF  
ANALYSIS-(PRACTICALS)  
PRACTICALS BASED ON THEORY**

1.1T Advanced Instrumental Methods of Analysis (AIMA)

Recommended Books

1. Instrumental Methods of Analysis-Willard, Merrit, Dean et.Al
2. A Text Book of Pharmaceutical Analysis (Vol. 1 & 2) - Roger E.Schirmer
3. Methods of Drug Analysis -Gaerian & Grabowski
4. A Text Book of Pharmaceutical Analysis - K.A.Connors
5. Practical Pharmaceutical Chemistry (Vol. 1 & 2) - Beckett & Stenlake
6. Pharmaceutical Analysis - P.Parimoo
7. Spectroscopy - Silverstein
8. Organic Spectroscopy - William Kemp
9. Pharmaceutical Analysis - Modern Methods by J.W.Munson, (Marcel Dekker)

**I/II M.PHARMACY (1<sup>st</sup> Semester)**

**1.2 T : ADVANCED PHARMACEUTICAL ANALYSIS**

1. A detailed study of principles and physico-chemical techniques involved in the analysis of pharmaceutical formulations like
  - i) Antibiotics (ii) Steroid Hormones (iii) Vitamins (iv) NSAIDs
  - v) Sulfa drugs.
2. A detailed study of principles and physico-chemical techniques involved in the analysis of pharmaceutical formulations like
  - i) Anti-cancer drugs (ii) Anti-HIV drugs (iii) Diuretics (iv) Analgesics
3. General methods of quality control of the following as per Indian Pharmacopoeia.
  - i) Tablets (ii) Capsules (iii) Liquid orals (iv) Parenterals
4. Quality control of crude drugs :  
Ash value, extraction values, preparation, characterization, usage, storage and records.
5. Reference standards-source, preparation, characterization, usage, storage and records.

**1.2 P PRACTICALS : BASED ON THEORY**

**Recommended Books :**

1. Pharmaceutical Analysis - T.Higuchi
2. Indian Pharmacopoeia (Government of India)
3. Text book of Pharmacognosy - C.K.Kokate

**I/II M.PHARMACY (1<sup>st</sup> Semester)**

**1.3. T : BIOLOGICAL ASSAYS, IMMUNOLOGICAL ASSAYS AND TOXICITY STUDIES**

**a) Biological Methods of Analysis :**

Introduction and a detailed study of the following biological assays as per Indian Pharmacopoeia 1985.

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|---------------------------|---------------------------|
| 1. Heparin Sodium         | 2. Hyaluronidase          |
| 3. Chorionic gonadotropin | 4. Insulin                |
| 5. Oxytocin               | 6. Vasopressin            |
| 7. Diphtheria Antitoxin   | 8. Gas-gangrene antitoxin |
| i. Oedematiens            |                           |
| ii. Perfringens           |                           |
| iii. Speticum             |                           |
| 9. Rabies antiserum       | 10. Tetanus antitoxin     |
| 11. Petrusis Vaccine      | 12. Thyroid Vaccine       |

**b) Immunological Methods of Analysis :**

Introduction and a detailed study of Radio Immuno Assay (RIA) and Enzyme linked Immunosorbent Assay (ELISA). Microbiological Assay of Vitamins and Antibiotics.

**c) Toxicity Studies :**

1. A study of the following as per Indian Pharmacopoeia 1985
2. Test for Histamine like substances
3. Test for pyrogens
4. Test for undue Toxicity

**RECOMMENDED BOOKS :**

1. Indian Pharmacopoeia (Vol. 1 & 2) published by Ministry of Health & Family Welfare, Government of India.