

DEPARTMENT OF CHEMISTRY

VALUE ADDED COURSE

Semester	Course Code	Course Title	Hours
III	22UCHVAC1	THIN LAYER AND COLUMN CHROMATOGRAPHIC TECHNIQUES	30

Course Outcomes:

At the end of the course students will be able to:

- CO 1: Choose the suitable solvent for chromatographic techniques.
- CO 2: Understand the different types of column packing in column chromatography
- CO 3: Apply paper chromatography for the separation of compounds
- CO 4: Investigate the mixture of compounds by column chromatography
- CO 5: Categorize the metallic ions by column chromatography

UNIT-I: Thin Layer Chromatography

6 Hours

- 1.1 Thin Layer Chromatography-Principle, techniques of thin layer chromatography-preparation of chromatoplates, application of sample on the chromatoplates,
- 1.2 Choice of adsorbents, selection of solvents, locating the reagents, developing chamber, development, types, location of compounds.
- 1.3 R_f value, factors affecting R_f value, detection, estimation and identification.

UNIT-II: Column Chromatography

6 Hours

- Column chromatography-principle, types-adsorption, partition and ion-exchange
- 2.1 Experimental Techniques-adsorption column-packing of column-wet and dry, factors affecting column efficiency.
 - 2.2 Adsorbents, solvents, developers, identification of compounds.

UNIT-III: Thin Layer Chromatography-Practical

6 Hours

- Preparation of TLC plates
- Separation of commercial inks
- Separation of dyes- malachite green, fluorescein, rhodamin-B

UNIT-IV: Column Chromatography-Practical –I

6 Hours

- Separation of methylene blue and malachite green dyes on alumina.
- Separation of black ink and red ink

UNIT-V: Column Chromatography-Practical –II

6 Hours

- Separation of metallic ions Pb^{2+} , Cd^{2+} and Bi^{3+} on alumina
- Separation of ferric alum and copper sulphate on alumina

Text Books:

S. No	Author	Book	Edition	Publisher Details	Year	Units Covered
1.	V.K.Srivastava, K. Kishore	Introduction to Chromatography: Theory and Practice	3 rd Edition (Reprint)	S. Chand, New Delhi	1987	I-V

Semester	Course Code	Course Title	Hours
V	22UCHVAC2	MOLECULAR STRUCTURE DRAWING TOOL	30

Course Outcomes:

At the end of the course students will be able to:

- CO 1: Understand the software used in chemistry
- CO 2: Perform the Manipulations of Selected Objects
- CO 3: Apply the chemdraw software to draw the different systems
- CO 4: Generate the IUPAC and physical properties of organic compounds
- CO 5: Predict resonance spectral data of chemical structures.

UNIT-I: Molecular Structure Drawing Tool 6 Hours

ChemDraw - Introduction, Installation, Drawing molecular structures - structure types, drawing the framework of a structure, Drawing Bonds of Different Types / Changing Bond Types, Introducing Atom Labels,

UNIT-II: Manipulations with Selected Objects 6 Hours

Manipulations with Selected Objects- Select Objects, Move Objects, Copy Objects, Rotate and Mirror Objects, Stretch/Shrink/Scale Objects, Structure Perspective, Join Objects.

UNIT-III: ChemDraw-Practical I 6 Hours

- Drawing of molecules - acyclic, cyclic, heterocyclic and bicyclic systems
- Analysis of molecules - formula, exact mass and elemental analysis
- Graphical representation of reaction scheme

UNIT-IV: ChemDraw-Practical II 6 Hours

- Chemical structures to IUPAC names
- IUPAC naming to chemical structures
- 2D structures into 3D structures
- Prediction of boiling point, melting point, critical temperature, critical pressure, critical volume and heat of formation.

UNIT-V: ChemDraw-Practical III 6 Hours

- Prediction of ^1H NMR & ^{13}C NMR of following compounds:
Ethanol, Ethyl methyl ketone, Cycloheptonone, Pyridine and α -naphthol

Text Books:

S. No	Author	Book	Edition	Publisher Details	Year	Units Covered
1.	Dr. Stefan Bienz	Short Manual to the Chemical Drawing Program ChemDraw	-	University of Zurich	-	I-V

Semester	Course Code	Course Title	Hours
III	22PCHVAC1	UV-VISIBLE, IR SPECTROSCOPIC INSTRUMENTATION AND SEPARATION TECHNIQUES	30

Course Outcomes:

At the end of the course students will be able to:

- CO 1: Explain the fundamental components of UV-Visible spectrophotometer.
- CO 2: Familiarize the instrumentation of IR spectroscopy.
- CO 3: Examine the given material by UV-Visible spectroscopy.
- CO 4: Investigate the nature of the functional groups present in the sample by IR spectroscopy.
- CO 5: Separate the sample by distillation techniques.

UNIT-I: Instrumentation of UV-Visible Spectroscopy 6 Hours

- 1.1 UV-Visible Spectroscopy-principle, nomenclature of the components of IR instrument - fundamental components- Schematic diagram of fundamental components, photometer, spectrometer optical, spectrophotometer, colorimeter and spectrograph.
- 1.2 UV-Visible Radiation source - essential characteristics, UV- light sources, visible light sources;
- 1.3 Dispersing devices, filters and monochromators: prism, gratings; slits, test sample and optical materials, radiation detector and indicator- barrier layer cell, photo emissive cell, photomultiplier cell.

UNIT-II: Instrumentation of IR Spectroscopy 6 Hours

- 2.1 IR Spectroscopy- principle, instrumentation-IR spectrometer-types-single beam and double beam spectrometer;
- 2.2 Source of IR radiation, IR mono chromator, detector- selective detector-photo conductive cell; non-selective detectors- thermocouple, bolometer, pneumatic detector cell.
- 2.3 Preparation of sample- liquid, solid; characteristic group frequencies.

UNIT-III: UV-Visible Spectroscopy- Practical 6 Hours

- Detection of λ_{\max} of given organic compounds: aniline, toluene, benzaldehyde, Acetophenone, *o*-cresol, ethyl acetate.
- Determination of indicator constant of an indicator
- Determination of band gap of ZnO nanoparticle.

UNIT-IV: IR Spectroscopy-Practical 6 Hours

- Identification of functional groups of organic compounds- urea, benzaldehyde, cinnamic acid, glucose and acetophenone.
- Determination of the purity of the commercial benzoic acid

UNIT-V: Separation Techniques – Practical 6 Hours

- Purification of aniline by distillation.
- Separation of organic liquid mixture by fractional distillation.
- Removal of solvent from a reaction mixture by reduced pressure distillation.

Text Books:

S. No	Author	Book	Edition	Publisher Details	Year	Units Covered
1.	A. K. Srivastava and P. O. Jain	Instrumental Approach to Chemical Analysis	4 th Revised Edition	S. Chand & Company Ltd., New Delhi	2008	I-V