Course Code	Course Name	Credits
26CH105	SEPARATION CHEMISTRY	04

Course Objectives

- To develop an understanding of separation chemistry.
- To explain the principles behind various separation techniques.
- To enable identification of suitable methods for different mixtures.
- To provide knowledge on how to separate components in a mixture.
- To build practical and analytical skills in applying separation techniques.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Understand the principles and applications of separation techniques such as distillation, extraction, dialysis, and flotation.
- Explain the theory, classification, and mechanisms of chromatographic techniques including column, paper, and TLC methods.
- Apply instrumental methods such as GC, HPLC, and ion-exchange chromatography for qualitative and quantitative analysis.
- Evaluate purification and analytical techniques for separation, identification, and characterization of organic compounds.

Unit-1 – Separation Techniques – Distillation, Extraction and Membrane Processes (12 Hrs.)

Distillation – principle; theoretical plates and HETP; applications; solvent extraction – distribution law; batch and continuous extraction; extraction of solids and applications; flotation – theory, cell and its operation and applications; dialysis – theory, membranes and their choice; electrodialysis and applications.

Unit 2 - Chromatographic Methods – Principles and Planar Techniques (12 Hrs.)

General aspects of chromatography; classification; mechanism; band broadening and column efficiency; column chromatography – construction and operation of column; choice of adsorbents and eluents; applications; paper chromatography – mechanism of separation; qualitative and quantitative applications; thin layer chromatography – choice of adsorbent, solvents and applications; high performance thin layer chromatography (HPTLC); ion-exchange chromatography – techniques and applications.

Unit 3 – Purification Techniques of Organic Compounds (12 Hrs.)

General purification techniques; purification of solid organic compounds – recrystallization; sublimation; use of miscible solvents; use of drying agents and their properties; purification of liquids; techniques of distillation; chemical methods of purification; tests of purity.

Unit 4 – Gas Chromatography and Hyphenated Techniques (12 Hrs.)

Gas chromatography – types; nature and selection of stationary and mobile phases; solid supports and their choice; columns – packed, open and capillary; sampling methods; instrumentation; detectors – types, sensitivity and limit of detection; operative principles of TCD, FID and ECD; comparison of detectors; temperature programming; derivative chromatography; hyphenated techniques; qualitative and quantitative applications; GC–MS and GC–IR.

Unit 5 - Advanced Liquid Chromatography Techniques (12 Hrs.)

High performance liquid chromatography (HPLC) – theory and equipment; types of pumps and their choice; types of columns and choice of column materials; detectors and applications; size exclusion chromatography – theory; gel filtration and gel permeation; supercritical fluid chromatography.

Reference Books:

1. Skoog and Leary, Principles of Instrumental Analysis –IV Edition,1992 Saunders College Publishing.
2. A.I. Vogel, ELBS, TextBook of Quantitative Inorganic Analysis –, III Edition, 1976, and IV Edition, 1985.
3. E.W. Berg, Physical and Chemical Methods of Separation 1963 McGraw Hill Publications.
4. Willard, Merit, Dean and Settle Instrumental Methods of Analysis 1986 CBS Publ. & Distributors, VI Edition.

Websites and eLearning Sources:

1. https://youtu.be/MD_M_xbEUig?si=YA3ihHiQ-UKB6Sn6
2. https://www.organomation.com/solvent-extraction-techniques

COs and Bloom's Taxonomy Mapping – 26CH105		
Course Outcomes	**On completing U.G. program the students will be able to**	**BTL**
CO1	Understanding and remembering the basic principle of Distillation, distribution law, floatation theory and dialysis.	K1, K2
CO2	Applying the method involves in chromatography and the technique involve in separation mechanism.	K3
CO3	Selecting the adsorbate for thin layer chromatography and testing for high purity of solvent extraction.	K4
CO4	Utilizing the different technique according to choice of column and capillary and apply for detection of variety of samples.	K5
CO5	Operation and construction of HPLC and their application in various industrial and scientific analysis.	K6

BTL K1 and K2 – remembering and understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6- Create

Relationship Matrix – 26CH105													
Course Outcomes	**Programme Outcomes (POs)**						**Programme Specific Outcomes (PSOs)**						**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	2	2	2	1	1	2	2	1	1	1	1	1.58
CO2	3	3	2	2	2	1	2	3	2	2	1	2	2.08
CO3	3	3	2	2	2	1	2	3	2	2	1	1	2
CO4	3	3	3	2	2	1	3	3	2	3	2	2	2.41
CO5	3	3	3	3	2	1	3	3	3	3	2	1	2.5
												Total	2.11

Mean Score: 3- High, 2- Medium/Moderate, 1-Low

FULLY HUMAN
Fully Alive