



Chemical Separation Methods

Course Code	Course Num.	Course Name	Credit Hours	Lec	Lab	Tut	Prerequisites
CHM	333	Chemical Separation Methods	4	2	3	1	CHM 332

Objectives:

The main objective of this course is to familiarize students with the fundamental principles of separation processes used in analytical chemistry such as various extraction techniques, gas and liquid chromatography, size and ion chromatography and electrophoresis. By completion of the course, students are also expected to gain independent laboratory skills in certain separation techniques and they will have the ability to interpret data from analytical separation methods.

Syllabus:

Introduction to separation, Pre-concentration. Classification of separation methods depending on the basis of separation. Classical separation methods. Introduction to the developed method of separation,.

Extraction techniques, theory and applications on liquid-liquid, liquid -solid , soild-pahse micro extractions and stir-bar sorptive extraction techniques. Comparison of the efficiency of various techniques, and methods improvement.

Chromatographic theory chromatographic methods, mechanism of separation. Column efficiency, Band broadening and resolution, (HETP) theoretical plates. Thin layer chromatography(TLC).

Gas chromatography, instrumental design, gas type selection, methods of sample introducing or injection(split, splitless , split-splitless and purge and trap. Types of detectors, (ECD, FID, NPD, PID) and connection to MS. Columns(capillary and packed) , chemically bonded and comparing the efficiency. Temperature programmed (oven) and quantitative analysis (applications).

High performance Liquid Chromatography(HPLC), theory of operation, instrumental design, function of various parts of the machine , solvent delivery(pumps), types of pumps and requirements. Column specification and polarity, column selection, detectors (UV-Vis., Fluorescence , RI, Diode array,,) and connectivity to MS. Operational modes of HPLC(Reverse and Normal phase) quantitative analysis and applications.

Ion chromatography, cation and anion exchange resin, and size exclusion chromatography. Electrophoresis, its principle and capillary electrophoresis.

Textbook:

Quantitative Chemical Analysis, Daniel C. Harris, 8th edition,2010, W. H. Freeman & Co., New York, ISBN: 9781429218153

References:

1. Modern Analytical Chemistry, David Harvey, McGraw-Hill, 1st ed, 2000, ISBN: 0-07-237547-7
2. Chemical Analysis: Modern Instrumentation Methods and Techniques, Francis Rouessac, AnnickRouessac, John Wiley & Sons, 2nd ed, 2007.ISBN: 0470859040, 9780470859049
3. Principles of Instrumental Analysis", D. A. Skoog, F. J. Holler, S.R. Crouch, Brooks Cole, 6th edition (Dec 6 2006) , ISBN: 0495012017 , 978-0495012016

