

86S1-MESEP

SEPARATION METHODS

ECTS: 4.0

HOURS PER SEMESTER/WEEK: LECTURES: 30/2; CLASSES: 45/3

FIELD OF THE STUDY: Chemistry

Level of study: First-cycle (Bachelor's degree) program

Course status: obligatory *

Year of the study: II

COURSE CONTENTS

LECTURES: The theoretical basis of chromatographic separation. Classification of separation methods. Pre-concentration. Extraction techniques, theory, and application on liquid-liquid, liquid-solid, solid-phase micro extraction. Comparison of the efficiency of various extraction techniques. Mechanism of separation. Chromatographic methods. Column efficiency. Band broadening and resolution. Thin layer chromatography. Gas chromatography, instrumental design, gas type selection, methods of sample introduction or injection (split, splitless, split-splitless, and purge and trap). Types of detectors (ECD, FID) and connection to MS. Type and efficiency of GC columns (capillary and packed). Temperature programmed (oven) and quantitative analysis. High-Performance Liquid Chromatography (HPLC) – instrument design. Solvent delivery system and types of pumps. HPLC column specification and polarity, mobile phases, column selection, HPLC detectors (UV-Vis, FL, RI, Diode Array), and connection to MS. Reverse and Normal mode of HPLC. Ion chromatography. Cation and anion exchange resin. Electrophoresis.

CLASSES: The student learns how to use specialized laboratory equipment and laboratory glassware. Practical use of the extraction technique. GC as well as HPLC chromatographic analysis.

EDUCATIONAL PURPOSE: The main objective of this course is to familiarize students with the fundamental principles of the separation processes used in analytical chemistry such as various extraction techniques, gas, and liquid chromatography, and electrophoresis. Developing the ability to solve problems related to the separation of the mixture of different chemical compounds. Developing the skills of proper chromatographic analysis and interpretation of results, validation of the analytical procedure and the method as well as the ability to write correct report correctly.

LEARNING OUTCOMES

Knowledge. The student knows the mechanism of chromatographic separation and identifies factors that determined the efficient separation of analyzed compounds. He knows the construction and operation of GC and HPLC chromatographs.

Skills. The students are able to explain the essence of the extraction process. He is able to select the appropriate techniques depending on the compounds to be determined. The student is able to analyze the sample by GC and HPLC chromatography. He can write a report on the performed analytical determination. He can apply health and safety rules in the analytical laboratory.

Social competences. The student evaluates objectively the contribution of one's own work and that of others in the joint research and report preparation. He is aware of the continuous improvement of his knowledge.

TEACHING FORMS AND METHODS

Lectures. Information lecture, Lecture with a multimedia presentation of selected issues.

Classes. Discussion, Case study, Laboratory methods, Demonstration and observation, Work in groups.

FORM AND CONDITIONS FOR VERIFICATION OF LEARNING OUTCOMES

Lectures. written test - credit with a grade.

Classes. written test - credit with grade.

BASIC LITERATURE

1) Harvey D. 2000. Modern Analytical Chemistry. 1st ed. Wyd. McGraw-Hill

ADDITIONAL LITERATURE

1) Harris D.C. 2010. Quantitative Chemical Analysis. 8th edition. Wyd. W.H. Freeman & Co

THE TEACHER/TEACHERS CONDUCTING THE CLASSES:

dr hab. Danuta ZIELIŃSKA, prof. UWM danuta.zielinska@uwm.edu.pl

Department of Chemistry, Plac Łódzki 4, 10-721 Olsztyn, POLAND