COURSE DESCRIPTION CARD - SYLLABUS

Course name
Instrumental Analysis

Course

Field of study	Year/Semester
Environmental Protection Technologies	II/4
Area of study (specialization)	Profile of study
-	general academic
Level of study	Course offered in
First-cycle studies	Polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
0	60	0
Tutorials	Projects/seminars	
0	0	

Number of credit points
5

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Joanna Zembrzuska

email: joanna.zembrzuska@put.poznan.pl

tel. 0616652015

Wydział Technologii Chemicznej

ul. Berdychowo 4, 60-965 Poznań

Responsible for the course/lecturer:
dr hab. inż. Magdalena Krawczyk-Coda

email: magdalena.krawczyk@put.poznan.pl

tel. 0616652283

Wydział Technologii Chemicznej

ul. Berdychowo 4, 60-965 Poznań

Prerequisites

Basic knowledge of analytical chemistry, apparatus used in the chemical laboratory, mathematical tools used in the chemical calculations.

Student should be able to use English.

Student should be able to self-educate.

Student should understand the need to supplement her/his education and increasing personal and professional competences.

Course objective

The aim of this course is to familiarize students with the principle of operation and practical use of selected instrumental techniques.

Course-related learning outcomes

Knowledge

1 The graduate has a knowledge of techniques and methods of characterizing and identifying chemicals which are typical environmental pollutants. [K_W09]

2. The graduate has a knowledge of the risks associated with the implementation of chemical processes and risk assessment principles, knows international conventions and EU technical safety directives, and knows the rules governing the organization of the market in chemical products (REACH). [[K_W016]]

Skills

1. The graduate selects analytical methods for qualitative and quantitative analysis of chemical compounds [K_U12]

2. The graduate selects methods of controlling the course of the processes and evaluating the quality of products and raw materials [K_U15]

3. The graduate can estimate the suitability and select the tools and methods to solve the problem in the field of environmental protection technologies [K_U18]

4. The graduate acquires information from literature, databases and other sources related to chemical sciences, integrates, interprets and draws conclusions and formulates opinions.[K_U01]

5. The graduate uses correct terminology and nomenclature in the field of environmental protection technologies , also in English [K_U08]

Social competences

1. The graduate understands the need to develop and improve his/her professional and personal competencies [K_K01]

2. The graduate is aware of the importance and understanding of non-technical aspects and effects of engineering activities, including its environmental impact and the resulting responsibility for his/her decisions [K_K02]

3. The graduate can cooperate and work in a group, accepting various roles in it [K_K03]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Oral or written control of the student's knowledge before the laboratory classes. Written reports of the performed exercises.

Programme content

The cycle of the laboratory includes spectroscopic, electrochemical and chromatographic techniques:

1. Ion-selective electrodes - determination of fluoride in mouthwash, toothpaste and tap water ;

2. Potentiometric titration - determination of phosphoric acid in the Coca -Cola ;

3 Voltammetric determination of cadmium ions

4. Voltammetric determination of ascorbic acid

5.Voltammetric determination of iodides using screen-printed electrode (SPE).

6. Gas chromatography - qualitative analysis of the composition of the solvent.

7. Atomic absorption spectrometry - determination of manganese in the waste sample and/or in vitamin supplement.

8. Atomic absorption spectrometry – optimization of parameters of electrothermal atomization for selected elements.

9.Flame photometry - the determination of sodium and potassium in the waste water and tap water samples

10. Spectrography - Qualitative analysis of alloys ;

11. Spectrophotometry I - Determination of NO2- in water;

12. Spectrophotometry II - Determination of iron (II)ions as a complex with o-phenanthroline in waste sample

Before the laboratory course, students are acquainted with the general principles of health and safety at work in the

chemical laboratory. During the training , safety instructions for a workplace are given.

After laboratory course, the student has the opportunity to improve or supplement the missing experiments.

Teaching methods

Performing experiments using instrumental techniques - practical classes

Bibliography

Basic

1. A. Cygański, Metody spektroskopowe w chemii analitycznej, WNT, Warszawa 1995

2. Z. Witkiewicz, Podstawy chromatografii, WNT, Warszawa 1995

3. A. Cygański, Podstawy metod elektroanalitycznych, WNT, 1999

4. J. Minczewski, Z. Marczenko, Chemia Analityczna. Analiza Instrumentalna, T.3, PWN, Warszawa 1985

5. P. Sudera, J. Silbering, Spektrometria mas, Wyd. Uniwersytetu Jagiellońskiego Kraków 2006

Additional

1. J. Dojlido, J. Zerbe, Instrumentalne metody badania wody i ścieków, Arkady, Warszawa 1997

2. W. Szczepaniak, Metody instrumentalne w analizie chemicznej, PWN, Warszawa 2002

3. D.A. Skoog, D.M. West, F.J.Holler, S.R. Crouch, Podstawy chemii analitycznej, T. 1 i 2, PWN, Warszawa 2006

4. Z. Witkiewicz, J. Hetper, Chromatografia gazowa, WNT, Warszawa 2001

5. J. Namieśnik, Z. Jamórgiewicz, M. Pilarczyk, L. Torres, Przygotowanie próbek środowiskowych do analizy, WNT Warszawa 2000

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	75	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	50	2

[1] delete or add other activities as appropriate