

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Analytical Chemistry		Code 1010701221010710010
Field of study Chemical Technology	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 2
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 2 Classes: - Laboratory: 3 Project/seminars: -		No. of credits 4
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art		ECTS distribution (number and %)
Responsible for subject / lecturer:		
dr inż. Mariusz Ślachciński email: Mariusz.Slachcinski@put.poznan.pl tel. 616652005 Wydział Technologii Chemicznej ul. Piotrowo 3 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of inorganic chemistry, apparatus used in the chemical laboratory, mathematical tools used in the chemical calculations.
2	Skills	Usage a of basic chemical apparatus and volumetric glassware.
3	Social competencies	Understands the need to supplement her/his education and increasing personal and professional competences.
Assumptions and objectives of the course:		
To familiarize students with the practical use of conventional techniques and methods used in analytical chemistry. Learning the proper way to conduct (methodology, preparation of standard solutions, titration, weighing, precipitation and filtration, washing, drying) the methods used in the laboratory (acid-base titration, oxidation-reduction titrations, complexometric titration, precipitation, gravimetric techniques) as well as the acquisition of proficiency in analytical calculations which will shape the student's confidence in their own skills in performing the analyzes		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student has the necessary knowledge in the field of chemistry for the understanding of phenomena and processes occurring during the reaction used in analytical chemistry - [[K_W03,K_W11]]		
2. Student has a systematic, theoretically founded general knowledge in the field of analytical chemistry - [[K_W08]]		
Skills:		
1. Student can obtain the necessary information from the literature to conduct the determination of an analyte in the test sample - [[K_U01]]		
2. Student is able to perform basic chemical analysis, interprets the results of analyzes and draw appropriate conclusions - [[K_U01, K_U18, K_U21]]		
3. Student is able to work both individually and in team during the laboratory work - [[K_U02]]		
Social competencies:		
1. The students understand the need for self-studying and improvement of their professional competences. - [[K_K01]]		
2. The student is aware of the principles of engineering ethics. - [[K_K02, K_K05]]		
3. Students can cooperate and work in a group, taking different roles. - [[K_K03]]		
Assessment methods of study outcomes		

Written control work (acid-base titration, oxidation-reduction titrations, complexometric titration, precipitation). Oral and written control of the student's knowledge before the laboratory classes. Written reports of the performed exercises.

Course description

Practical aspects of analytical chemistry : ionic activity and ionic strength in solutions, strong and weak electrolytes; balance in the acid-base reactions, oxidation-reduction reactions/titrations, complexes and complex formation titrations, precipitate-formation titrations; volumetric analysis techniques (titration curves, indicators, analytical calculations,)

1 The assessment of risks occurring during the laboratory work

2. The volumetric analysis:

-ACID-BASE TITRATIONS

- determination of the total acidity or alkalinity of the solution
- determination of NaHCO₃ and Na₂CO₃
- determination of ammonia by the formalin

-OXIDATION-REDUCTION TITRATIONS

- determination of Ca²⁺
- determination of dissolved oxygen by the Winkler method .
- determination of phenol

-COMPLEX FORMATION TITRATIONS

- determination of iron.
- determination of calcium and magnesium.

-PRECIPITATE-FORMATION TITRATIONS

- determination of chloride using Mohr method
- determination of chloride using Volhard method

Basic bibliography:

1. D.A.Skoog, D.M. West, F.J. Holler, S.R. Crouch, Podstawy chemii analitycznej, t.1 i 2, WNT Warszawa 2006/2007
2. J. Minczewski, Z. Marczenko, Chemia analityczna, t.1 i 2, WN PWN Warszawa 2007
3. A. Cygański, Chemiczne metody analizy ilościowej, WNT Warszawa 2005
4. A. Cygański, B. Ptaszyński, J. Krystek, Obliczenia w chemii analitycznej, WNT Warszawa 2004
5. M. Wesołowski, K. Szefer, D. Zimna, Zbiór zadań z analizy chemicznej, WNT Warszawa 2002

Additional bibliography:

1. W. Ufnalski, Równowagi jonowe, WNT Warszawa 2004
2. A. Hulanicki, Reakcje kwasów i zasad w chemii analitycznej, WN PWN Warszawa 1992
3. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, WN PWN Warszawa 1993

Result of average student's workload

Activity	Time (working hours)	
1. lecture	30	
2. lecture consultations	6	
3. lab consultations	6	
4. lab preparations	15	
5. laboratory classes	45	
6. credit preparation	20	
7. credit	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	124	4
Contact hours	89	0
Practical activities	51	0