

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Instrumental Analysis		Code 1010701231010710011
Field of study Chemical Technology	Profile of study (general academic, practical) (brak)	Year /Semester 2 / 3
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: 2 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:		
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Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of inorganic and analytical 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 instrumental methods (apparatus, physicochemical phenomena, quantitative and qualitative analysis) and presentation of the possibility of using the instrumental techniques in industry, agriculture, environmental protection, health and scientific institutions.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. 1. Student has the necessary knowledge in the field of instrumental techniques for the understanding of phenomena and processes occurring during analysis - [[K_W03,K_W11]]		
2. Student has a systematic, theoretically founded general knowledge in the field of instrumental analysis - [[K_W08]]		
Skills:		
1. Student potrafi pozyskiwać niezbędne informacje z literatury, pozwalające na przeprowadzenie oznaczenia danego składnika w próbce analitycznej z zastosowaniem odpowiedniej techniki instrumentalnej - [[K_U01]]		
2. Student potrafi wykonać podstawowe analizy chemiczne stosując odpowiednią aparaturę. Właściwie interpretuje wyniki analiz i wyciąga z nich odpowiednie wnioski - [[K_U01, K_U18, K_U21]]		
3. Student potrafi pracować zarówno indywidualnie, jak i zespołowo w trakcie pracy laboratoryjnej - [[K_U02]]		
Social competencies:		
1. Student can obtain the necessary information from the literature to conduct the determination of an analyte in the test sample using instrumental technique - [[K_K01]]		
2. Student is able to perform basic chemical analysis, interprets the results of analyzes and draw appropriate conclusions - [[K_K02, K_K05]]		
3. Student is able to work both individually and in team during the laboratory work - [[K_K03]]		
Assessment methods of study outcomes		

<p>Oral and written control of the student's knowledge before the laboratory classes. Written reports of the performed exercises. Oral or written exam.</p>		
<p>Course description</p>		
<p>Theoretical basis of physicochemical phenomena leading to the analytical signal measurement, signal measurement methods , analytical characteristics of the method, the use of the method. Absorption and emission spectrometry, atomic absorption spectrophotometry UV and VIS , spectrofluorimetry , turbidimetry and nephelometry , electrochemical methods , chromatography , thermogravimetry , continuous and flow injection analysis, kinetic methods of analysis .</p> <p>The cycle of the laboratory includes spectroscopic, electrochemical and chromatographic techniques:</p> <ol style="list-style-type: none"> 1. Ion-selective electrodes - determination of fluoride in toothpaste and tap water ; 2 Potentiometric titration - determination of phosphoric acid in the Coca -Cola ; 3 Voltammetric determination of cadmium ions in the test samples; 4 Gas Chromatography - qualitative analysis of the composition of the solvent. 5 Atomic absorption spectrometry - quantitative determination of manganese in the waste water sample, 6 Flame photometry - the determination of sodium and potassium in the waste water and tap water samples 7 Spectrography - Qualitative analysis of alloys ; 8 Spectrophotometry I - Determination of NO₂- in water; 9 Spectrophotometry II - Determination of iron (II)ions in the test sample 		
<p>Basic bibliography:</p> <ol style="list-style-type: none"> 1. D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Podstawy Chemii Analitycznej T. 1 i 2, PWN, Warszawa, (1)2006, (2)2007 2. J. Minczewski, Z. Marczenko, Chemia Analityczna. Analiza Instrumentalna T. 3, PWN, Warszawa, 1985 3. A Cygański, Metody elektroanalityczne, WNT, Warszawa 1999 4. A Cygański, Metody spektroskopowe w chemii analitycznej, WNT, Warszawa 1995 5. Z. Witkiewicz, Podstawy chromatografii, WNT, Warszawa 1995 		
<p>Additional bibliography:</p> <ol style="list-style-type: none"> 1. J. Dojlido, J. Zerbe, Instrumentalne metody badania wody i ścieków, Arkady, Warszawa 1997 		
<p>Result of average student's workload</p>		
<p>Activity</p>	<p>Time (working hours)</p>	
1. lecture	30	
2. lecture consultations	6	
3. lab consultations	6	
4. lab preparations	10	
5. laboratory classes	30	
6. credit preparation	20	
7. credit	2	
<p>Student's workload</p>		
<p>Source of workload</p>	<p>hours</p>	<p>ECTS</p>
Total workload	104	4
Contact hours	74	0
Practical activities	36	0