

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Chromatographic Methods in Environmental Protection		Code 1010702321010720126
Field of study Technologie ochrony środowiska - stacjonarne	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 2
Elective path/specialty Monitoring	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: - Classes: - Laboratory: 2 Project/seminars: -		No. of credits 2
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: prof. dr hab. inż. Adam Voelkel email: Adam.Voelkel@put.poznan.pl tel. (61) 665 3687 Wydział Technologii Chemicznej ul. Piotrowo 3 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic physical, inorganic, organic and analytical chemistry on academic level; knowledge of mathematical tools used in chemical calculations
2	Skills	Can use basic laboratory techniques of separation and cleaning of chemical compounds
3	Social competencies	Understands the need to supplement her/his education and increasing personal and professional competences
Assumptions and objectives of the course: Presentation of the fundamentals of chromatographic processes; their application in qualitative and quantitative analysis as well as physicochemical characterization of organic and inorganic substances. The chromatographic equipment is discussed. Gaining the skills in the chromatographic analysis of organic species by means of basic chromatographic techniques, ability to select conditions of the analysis, maintenance of gas and liquids chromatographs, presentation and discussion of the results of the analysis.		
Study outcomes and reference to the educational results for a field of study		
Knowledge: 1. knowledge in the field of techniques, methods connected with the application of chromatographic techniques in environment protection - [K_W03, K_W09, K_W11] 2. can describe methods, techniques, tools and materials used for the solution of simple problems connected with the determination of various compounds in different environment matrices - [K_W07, K_W15]		
Skills: 1. Student can select the proper technique for the given determination - [K_U01, K_U08, K_U09, K_U14] 2. Student has basic skills for maintenance of gas or liquid chromatograph and to perform the chromatographic analyses - [K_U09] 3. Student can discuss chromatographic problems in English and prepare the appropriate presentation of collected results - [K_U05]		
Social competencies: 1. Student understands the need to supplement her/his education and increasing professional competences - [K_K01] 2. Student has the awareness to obey the engineer ethic rules - [K_K02, K_K05] 3. Student can act and cooperate in the group accepting different roles - [K_K03]		

Assessment methods of study outcomes		
Oral and written control before lab classes. Written reports and discussion of the obtained results.		
Course description		
Packed kolumn in GC		
2. Extraction to solid chase as sample preparation method to the gas chromatographic analysis with the use of capillary column		
3. Quantitative analysis in gas chromatography gazowej		
4. Thin layer chromatography in normal and reversed phase systems		
5. Determination of phenols by means of high performance liquid chromatography		
6. Determination of adsorption isotherms by means of gas chromatography		
7. Inverse gas chromatography in characterization of solid surfaces		
Basic bibliography:		
1. Podstawy chromatografii, Z.Witkiewicz, WNT, Warszawa, 2005.		
2. Zastosowanie metod chromatograficznych, K. Bielicka-Daszkiwicz, K. Milczewska, A. Voelkel, Wyd. PP, Poznań, 2005, 2010.		
3. Pobieranie próbek środowiskowych do analizy, J. Namieśnik, J. Łukasiak, Z. Jamrógiewicz, PWN, Warszawa, 1995		
Additional bibliography:		
1. Chromatografia gazowa, W. Rödel, G. Wölm, PWN, Warszawa 1992		
2. Techniques and practice of chromatography, R.P.W. Scott, Marcel Dekker, Inc., Nowy Jork, 1995.		
3. Chemia fizyczna, K. Pigoń, Z. Ruziewicz, PWN, Warszawa, 1993.		
Result of average student's workload		
Activity	Time (working hours)	
1. laboratory	30	
2. consultation before laboratory	5	
3. preparation to laboratory classes	10	
4. credit preparation	10	
5. credit	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	57	2
Contact hours	35	1
Practical activities	30	1