

FACULTY OF CHEMISTRY					
SUBJECT CARD					
Name in Polish:	Spectroskopia				
Name in English:	Spectroscopy				
Main field of study (if applicable)	Chemistry				
Specialization (if applicable):	Medicinal Chemistry				
Level and form of studies:	2nd level, full-time				
Kind of subject:	obligatory				
Subject code	CHC024060				
Group of courses	NO				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	60		60		
Form of crediting	Exam		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	2		2		
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes	1		1		
PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES 1. Knowledge of general chemistry. 2. Basic knowledge of physical chemistry. 3. Basic knowledge of organic chemistry. 4. Basic physiochemical calculations and mathematical analysis. 5. Basic knowledge of the spectroscopic methods used for structural analysis.					
SUBJECT OBJECTIVES C1 – Knowledge on various spectroscopic methods C2 - Acquisition of knowledge on selected interpretation techniques of one dimensional nuclear magnetic resonance spectra. C3 - Acquisition of knowledge on selected interpretation techniques of two dimensional nuclear magnetic resonance spectra. C4 - Acquisition of knowledge on selected interpretation techniques of FT-IR and MS spectra. C5 Knowledge on application of various methods in analysis. Scope and limitations.					
SUBJECT EDUCATIONAL EFFECTS Z zakresu wiedzy: PEK_W01 Knowledge on various spectroscopic methods PEK_W02 Knowledge on application of spectroscopic methods in analysis PEK_W03 Knowledge on application of spectroscopic methods in medical diagnosis Z zakresu umiejętności: PEK_U01 is able to prepare the material for analysis PEK_U02 is able to choose the appropriate method of analysis to the given problem PEK_U03 is able to analyse the spectra data					

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours
Lec1	Introduction to spectroscopic analysis, IR, NMR, UV, MS	2
Lec2	Interpretation to spectroscopic analysis of organic compounds structure	2
Lec3	Nuclear magnetic resonance, one dimensional spectra	2
Lec4	Design of spin system	2
Lec5	Special effects in NMR	2
Lec6	Two-dimensional NMR, theoretical introduction	2
Lec7	Interpretation of two-dimensional NMR	2
Lec8	Advanced techniques in IR	2
Lec9	Interpretation of IR spectral data	2
Lec10	Advanced techniques in NMR, theoretical interpretation	2
Lec11	Application of advanced techniques in NMR	2
Lec12	Spectroscopic analysis of dynamic systems	2
Lec13	Advanced spectroscopical methods in MS	2
Lec14	Application of spectroscopic methods in medical diagnostics.	2
Lec15	Review of simulation programs in analysis of spectra data	2
	Total hours	30
Form of classes - laboratory		Number of hours
La1	Introduction to the strategy of structure analysis.	2
La2	Analysis and interpretation of 1D ¹ H NMR spectra.	2
La3	Analysis and interpretation of 1D ¹ H NMR spectra.	2
La4	Analysis and interpretation of 1D ¹³ C NMR spectra.	2
La5	Analysis and interpretation of practical examples of 1-D ¹ H NMR, ¹³ C NMR spectra.	2
La6	Solving practical examples of 1-D NMR spectra.	2
La7	Two-dimensional NMR spectra analysis and interpretation.	2
La8	Solving practical examples of two-dimensional spectra.	2
La9	Infrared spectroscopy. Rules of spectra analysis.	2
La10	Analysis and interpretation of FT-IR spectra of unknown compounds.	2
La11	Mass spectroscopy. Molecular mass calculation. Confirming a molecular formula.	2
La12	Fragmentation patterns of molecules/ions. Solving practical examples.	2
La13	Practical spectroscopy problem solving.	2
La14	Determining the structure of organic compounds from different spectra.	2
La15	NMR and MS instrumentation.	2
	Total hours	30
TEACHING TOOLS USED		
N1. Problem lectures - multimedia presentations N2. Laboratory – problem exercises (multimedia presentations) N3. Laboratory – solving practical examples, drawing structures and spectra, performing calculations – using multimedia whiteboard N4. Independent work – preparation for the partial tests N5. Consultations		
EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation F – forming (during	Educational effect number	Way of evaluating educational effect achievement

semester), C – concluding (at semester end)		
P (lecture)	PEK_W01-W03	exam
F1 (laboratory)	L1-5	partial test I
F2 (laboratory)	L5-10	partial test II
F3 (laboratory)	L10-15	partial test III
P (laboratory) = average from partial tests grades		
PRIMARY AND SECONDARY LITERATURE		
<u>PRIMARY LITERATURE:</u>		
[1] K. Pigoń, Z. Ruziewicz, Chemia fizyczna t 2 Fizykochemia molekularna, Wyd. PWN, Warszawa 2007		
[2] P.W. Atkins, Chemia fizyczna, PWN 2001		
[3] R. M. Silverstein, F. X. Webster, D. J. Kiemle, Spektroskopowe metody identyfikacji związków organicznych PWN, Wrszawa 2007.		
[4] D. A. Skoog, D. M. West, F. J. Holler, S. R. Crouch, Podstawy chemii analitycznej 2, PWN, Warszawa 2007.		
[5] Z. Kęcki, Podstawy spektroskopii molekularnej, Wyd. PWN, Warszawa 1992.		
<u>SECONDARY LITERATURE:</u>		
[1] A. Cygański, Metody spektroskopowe w chemii analitycznej. WNT Warszawa, 2009		
[2] J. Demichowicz-Pigoniowa, Chemia fizyczna t 3, Obliczenia fizykochemiczne, PWN, Warszawa 2010		
[3] J. Najbar, A. Turek, Fotochemia i spektroskopia optyczna, PWN, Warszawa 2009.		
[4] P. Suppan, Chemia i światło, PWN, Warszawa 1997.		
[5] W. Zieliński, A. Rajca, Metody spektroskopowe i ich zastosowanie do identyfikacji związków organicznych, WNT, Warszawa 2000		
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADRESS)		
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