

## DESCRIPTION OF THE COURSE OF STUDY

<b>Course code</b>	<b>13.3-2CHM-C28</b>	
<b>Name of the course in</b>	Polish	Podstawy Metod Spektralnych
	English	Basics of Spectral Methods

### 1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

<b>1.1. Field of study</b>	<b>Chemistry</b>
<b>1.2. Mode of study</b>	<b>Full-time studies</b>
<b>1.3. Level of study</b>	<b>First-cycle studies</b>
<b>1.4. Profile of study*</b>	<b>General academic</b>
<b>1.5. Person/s preparing the course description</b>	<b>prof. dr hab. Piotr Słomkiewicz, dr hab. Beata Szczepanik prof. UJK dr Anna Kolbus</b>
<b>1.6. Contact</b>	<b>piotr.slomkiewicz@ujk.edu.pl</b>

### 2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

<b>2.1. Language of instruction</b>	<b>English</b>
<b>2.2. Prerequisites*</b>	<b>mathematics, physics, basics of chemistry</b>

### 3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

<b>3.1. Form of classes</b>	<b>Lectures, laboratory</b>	
<b>3.2. Place of classes</b>	<b>Classes in the teaching room of the UJK</b>	
<b>3.3. Form of assessment</b>	<b>Lecture - exam, laboratory - pass w/grade</b>	
<b>3.4. Teaching methods</b>	<b>Lecture, discussion, demonstration, experiments, project</b>	
<b>3.5. Bibliography</b>	<b>Required reading</b>	P. Atkins, J. De Paula: Physical Chemistry, Oxford University Press, 2006 D. L. Pavia, Introduction to Spectroscopy, Cengage Learning 2014 D. W. Ball, The Basics of Spectroscopy, 2001
	<b>Further reading</b>	Handbook of Spectroscopy: Second, Enlarged Edition Editor(s): Günter Gauglitz, David S. Moore, 2014 Wiley-VCH Verlag GmbH & Co. KGaA

### 4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

<p><b>4.1. Course objectives</b> (<i>including form of classes</i>)</p> <p>C1- Making the student acquainted with different types of spectroscopy and the use of spectroscopic methods in practice. (lecture)</p> <p>C2- Making the student acquainted with the physical basis of rotational, vibrational and electron absorption spectroscopy. (lecture)</p> <p>C3- Acquiring the ability to use spectroscopic equipment. (lab) C4- Introduction of methods for interpreting vibrational and electronic absorption spectra. (lab)</p>
<p><b>4.2. Detailed syllabus</b> (<i>including form of classes</i>)</p> <p><b>LECTURE</b></p> <p>General basics of molecular spectroscopy - nature and properties of electromagnetic radiation, forms of molecular energy, types of spectroscopy.</p> <p>Rotational spectroscopy - classical approach to molecular rotation, quantum-mechanical description of rotational motion, rotational spectra, determination of the length of chemical bonds from rotational spectra, rules for selecting rotational transitions, rotational spectra of two- and multi-atomic molecules.</p> <p>Vibrational spectroscopy - harmonic and anharmonic oscillator models, rules for selecting vibrational transitions, normal vibrations, active infrared vibrations, types of normal vibrations, infrared spectra of liquids and solids.</p> <p>Electron spectroscopy - electronic excitations, electronic transitions, rules for selecting electronic transitions, intensity of electronic transitions, probability of absorption and emission of radiation, electron spectrum, classification of bands in electronic spectra.</p> <p>Spectrophotometry - principle and division of spectrophotometry, laws of absorption of electromagnetic radiation, colorimetry, methods of spectrophotometric determinations, color systems that are the basis for colorimetric determinations, photocolorimetric and spectrophotometric equipment.</p> <p><b>LAB</b></p> <p>1) UV-VIS electronic absorption spectra.</p> <p>2) Spectrophotometric determination of the dye dissociation constant.</p>

3) IR spectroscopy.

#### 4.3 Intended learning outcomes

Code	A student, who passed the course	Relation to learning outcomes
within the scope of <b>KNOWLEDGE:</b>		
W01	Knows the basic concepts of spectroscopy in various spectral ranges. Explains the processes accompanying the interaction of electromagnetic radiation with chemical compounds. Knows and understands theoretical bases of different spectroscopic measurements	CHEM1A_W05
within the scope of <b>ABILITIES:</b>		
U01	performs measurements of absorption spectra in the appropriate spectral range, prepares the results of the exercises	CHEM1A_U02
U02	interprets spectra obtained in IR and UV-VIS spectroscopy	CHEM1A_U02
within the scope of <b>SOCIAL COMPETENCE:</b>		
K01	is ready to recognize the importance of knowledge in solving cognitive and practical problems	CHEM1A_K01

#### 4.4. Methods to verify the achievement of the learning outcomes

Teaching outcomes (code)	Method of verification (+/-)											
	Exam oral/written*			Test*			Project*			Group work*		
	Form of classes			Form of classes			Form of classes			Form of classes		
	W	C	...	W	K	L	W	K	L	W	K	L
W01	+				+	+						
W02	+				+	+						
W03	+				+	+						
U01												+
U02					+							+
U03					+	+			+			+
U04					+	+			+			+
U05					+				+			
K01	+											

\*delete as appropriate

#### 4.5. Criteria of assessment of the intended learning outcomes

Form of classes	Grade	Criterion of assessment
lecture (L) (including e-learning)	3	Exam - test, 51-60% correct answers
	3,5	Exam - test, 61-70% correct answers
	4	Exam - test, 71-80% correct answers
	4,5	Exam - test, 81-90% correct answers
	5	Exam - test, 91-100% correct answers
Seminar including e-learning	3	Pass w/grade - test, 51-60% correct answers
	3,5	Pass w/grade - test, 61-70% correct answers
	4	Pass w/grade - test, 71-80% correct answers
	4,5	Pass w/grade - test, 81-90% correct answers
	5	Pass w/grade - test, 91-100% correct answers
Laboratory exercises (including e-learning)	3	Pass w/grade - test, 51-60% correct answers
	3,5	Pass w/grade - test, 61-70% correct answers
	4	Pass w/grade - test, 71-80% correct answers
	4,5	Pass w/grade - test, 81-90% correct answers
	5	Pass w/grade - test, 91-100% correct answers

### 5. BALANCE OF ECTS CREDITS – STUDENT’S WORK INPUT

Category	Student's workload	
	Full-time studies	Extramural studies
<i>NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/</i>	<b>30</b>	<b>30</b>
<i>Participation in lectures*</i>	<b>15</b>	<b>15</b>
<i>Participation in classes, seminars, laboratories*</i>	<b>15</b>	<b>15</b>
<i>INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/</i>	<b>20</b>	<b>20</b>
<i>Preparation for the lecture*</i>		
<i>Preparation for the classes, seminars, laboratories*</i>	<b>10</b>	<b>10</b>
<i>Preparation for the exam/test*</i>	<b>10</b>	<b>10</b>
<i>TOTAL NUMBER OF HOURS</i>	<b>50</b>	<b>50</b>
ECTS credits for the course of study	<b>2</b>	<b>2</b>

*\*delete as appropriate*

**Accepted for execution** (date and legible signatures of the teachers running the course in the given academic year)

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