

COURSE OFFERED

Name of the course	Polish	Symetria w chemii
	English	Symmetry in Chemistry

1. LOCATION OF THE COURSE OF STUDY WITHIN THE EDUCATION SYSTEM

1.1. Section ¹	Section of Exact and Natural Sciences
1.2. Discipline ²	Chemical Sciences
1.3. Type of education	Stationary
1.4. Level of education	Doctoral School
1.5. Person preparing the course description	dr hab. Paweł Rodziewicz, prof. UJK
1.6. Contact	pawel.rodziewicz@ujk.edu.pl

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Type of course ³	specialized subjects in the discipline
2.2. Language of the course	English

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Type of classes ⁴	lecture	
3.2. The number of hours ⁵	15h	
3.3. Location of classes	lecture room at the institute of chemistry	
3.4. Type of assessment	pass with a grade	
3.5. Didactic methods	presentation and discussion	
3.6. Literature	basic	1. F. A. Cotton, „Chemical applications of group theory”, Wiley, 1991 2. B. S. Tsukerblat, „Group theory in chemistry and spectroscopy”, Dover Publication, 2006
	supplementary	1. R. Ameta, S. C. Ameta, „Chemical applications of symmetry and group theory”, Apple Academic Press Inc., 2017 2. K. C. Molloy, “Group theory for chemists. Fundamental theory and applications”, Woodhead Publishing, 2011

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDEND LEARNING OUTCOMES

4.1. Course objectives (including the form of classes)
C01 Gaining extended knowledge of the use of symmetry in describing the properties and reactivity of chemical molecules.

¹ Section of Humanities:, Social Sciences, Section of Exact and Natural Sciences, Section of Medical and Health Sciences, Section of Arts.

² History,Linguistics, Literary Studies, Medical Sciences, Health Sciences, Political and Administrative Sciences, Legal Sciences, Security Sciences, Pedagogy, Communication and Media Studies, Management and Quality Studies, Biological Sciences, Chemical Sciences, Physical Sciences, Earth and related Environmental Sciences, Visual Arts and Artwork Conservation, Musical Arts.

³ General courses, domain specific subjects in the section, disciplinary subjects in the sections, specialized subjects in the discipline.

⁴ Classes, lecture, seminar.

⁵ Consistent with the education program at the Doctoral School
Jan Kochanowski University in Kielce.

C02 Acquiring the ability to analyze the presence of symmetry elements and operations in chemical molecules and to determine the symmetry point group.

4.2. Syllabus content

1. Symmetry elements and operations.
2. Necessary conditions for the formation of a symmetry group.
3. Classification of chemical molecules into symmetry point groups.
4. Character theory. Reducible and irreducible representations.
5. Reduction of reducible representations to irreducible ones.
6. The role of molecular symmetry in statistical distributions.
7. Symmetry of atomic and molecular orbitals and its influence on the structure and chemical reactivity of molecules.
8. Symmetry in vibrational analysis (normal modes) and its influence on selection rules in spectroscopy.
9. Terms. Representations. The role of symmetry in Crystal Field Theory (CFT).

5. SUBJECT LEARNING OUTCOMES

Learning outcomes	A doctoral student who has passed the subject:	Reference to the learning outcomes of Doctoral School (according to the training program at the Doctoral School)
in the area of KNOWLEDGE:		
W01	The doctoral student possesses in-depth knowledge of group theory and its applications in chemistry, encompassing theoretical foundations, general issues, and selected specific topics relevant to the scientific discipline in which the doctoral dissertation is being prepared.	SD_W01
W02	doctoral student has advanced knowledge of development trends in the application of group theory in spectroscopy and formulates important, current and unresolved problems in the disciplines related to the research being pursued.	SD_W07
in the area of SKILLS:		
U01	The doctoral student can define the goal and subject of research using methods based on group theory, as well as formulate research hypotheses in the discipline where the doctoral dissertation is being prepared.	SD_U01
U02	The doctoral student can effectively use a foreign language in research or project activities.	SD_U07

6. METHODS OF ASSESSMENT OF THE INTENDED LEARNING OUTCOMES

SUBJECT LEARNING OUTCOMES	METHOD OF ASSESSMENT (+/-)																				
	Oral/written exam			Kolokwium			Project			activity in class			Own work			Group work			Others		
	The type of classes			The type of classes			The type of classes			The type of classes			The type of classes			The type of classes			The type of classes		
	L	C	S	L	C	S	L	C	S	L	C	S	L	C	S	L	C	S	L	C	S
W01							+														
W02							+														
U01							+						+								
U02							+						+								

7. CRITERIA OF ASSESSMENT OF THE INTENDED LEARNING OUTCOMES

Form of classes	Grade	Criterion of assessment
Lecture (L) ⁶	3,0	obtaining 51-60% of the total number of points for completing own work and project
	3,5	obtaining 61-70% of the total number of points for completing own work and project
	4,0	obtaining 71-80% of the total number of points for completing own work and project
	4,5	obtaining 81-90% of the total number of points for completing own work and project
	5,0	obtaining 91-100% of the total number of points for completing own work and project

Accepted for execution

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⁶ Niepotrzebne usunąć.