DESCRIPTION OF THE COURSE OF STUDY

Course code	**0719-2ID-F64-WFJ**	
Name of the course in	Polish	Wstęp do fizyki jądrowej
	English	Introduction to nuclear physics

1. LOCATION OF THE COURSE OF STUDY within the system of studies

1.1. Field of study	Data Engineering
1.2. Mode of study	Full-time
1.3. Level of study	First-cycle (Bachelor)
1.4. Profile of study*	General academic
1.5. Person/s preparing the course description	Dr Ilona Stabrawa
1.6. Contact	ilona.stabrawa@ujk.edu.pl

2. GENERAL CHARACTERISTICS OF THE course of study

2.1. Language of instruction	English
2.2. Prerequisites*	Physics 1, Physics 2

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. **Form of classes**		Lecture, exercises, project
3.2. **Place of classes**		Didactic rooms at Jan Kochanowski University (UJK)
3.3. **Form of assessment**		Lecture – graded credit, exercises – graded credit, project – graded credit
3.4. **Teaching methods**		Informative lecture, problem-based lecture, conversational exercises, individual project
3.5. **Bibliography**	**Required reading**	A. Strzałkowski, Wstęp do fizyki jądra atomowego, PWN, Warsaw T. Mayer-Kuckuk, Fizyka jądrowa, PWN, Warsaw E. Skrzypczak, Z. Szefliński, Wstęp do fizyki jądra atomowego i cząstek elementarnych, PWN, Warsaw J. Araminowicz, Laboratorium fizyki jądrowej, Państwowe Wydawnictwo Naukowe, Warsaw W. Tłaczała, Wirtualne laboratorium fizyki jądrowej, Warsaw University of Technology Press, Warsaw
	Further reading	W. Scharf, Akceleratory cząstek naładowanych i ich zastosowanie, PWN, Warsaw

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. Course objectives *(including form of classes)*

C1. To present issues concerning the structure of the atomic nucleus (properties, structure models, nuclear forces), radioactive decay processes, and nuclear reactions.

C2. To develop the ability to describe qualitative and quantitative aspects of nuclear physics phenomena.

4.2. Detailed syllabus *(including form of classes)*

Lecture:

1. Brief history of the development of nuclear physics
2. The atomic nucleus (isotopes, isobars, isotones, isomers)
3. Properties of stable nuclei and basic nuclear parameters
4. Nuclear forces, binding energy, and mass defect
5. Electric charge of nuclei, spin and magnetic moment of nucleons, hyperfine interaction
6. Models of nuclear structure
7. Radioactive decay (radioactive families)
8. Radiation spectra
9. Nuclear reactions and nuclear transformations
10. Natural and artificial sources of radiation

Exercises:

The same thematic scope as the lecture, including discussion and problem-solving related to nuclear parameters, nuclear forces, radioactive decay, and nuclear reactions.

Project:

Development of a concept for a simulation system (e.g., radioactive decay and statistical analysis of results) or analysis of data from gamma radiation detectors. Presentation of the project.

4.3 Intended learning outcomes

Code	A student, who passed the course	Relation to learning outcomes
within the scope of **KNOWLEDGE:**		
W01	Knows terminology, symbols, and basic concepts of nuclear physics. Understands the basic parameters characterizing the structure and properties of stable and unstable nuclei. Can explain the fundamental laws and physical principles concerning atomic nuclei. Knows main models of nuclear structure and the types of interactions between nucleons. Understands key stages and ideas in the development of nuclear physics.	ID1A_W03 ID1A_W04 ID1A_W11
within the scope of **ABILITIES:**		
U01	Can calculate fundamental parameters of nuclear structure. Estimates probabilities of radioactive transformations. Determines energy relations and kinematics of nuclear reactions. Uses the law of radioactive decay. Assesses the effects of nuclear radiation interactions with matter. Performs basic nuclear physics experiments and analyses results qualitatively and quantitatively.	ID1A_U04 ID1A_U05 ID1A_U06
within the scope of **SOCIAL COMPETENCE:**		
K01	Is ready for both independent and team work in the field of nuclear physics. Demonstrates willingness to systematically read scientific and popular-scientific journals in this field.	ID1A_K01 – K04

4.4. **Methods of assessment of the intended learning outcomes**

Teaching outcomes *(code)*	**Method of assessment (+/-)**																				
	Exam oral/written*			**Test***			**Project***			**Effort in class***			**Self-study***			**Group work***			**Others* e.g. standardized test used in e-learning**		
	Form of classes			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***		
	W	C	P	W	C	P	W	C	P	W	C	P	W	C	P	W	C	P	W	C	P
W01				***x***	***x***				***x***		***x***				***x***						
U01				***x***	***x***				***x***		***x***				***x***						
K01				***x***	***x***				***x***		***x***				***x***						

****delete as appropriate***

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

Form of classes	Grade	Criterion of assessment
lecture (W)	**3**	Achievement of 50–60% of assessment requirements
	3,5	Achievement of 60–70%
	4	Achievement of 70–80%
	4,5	Achievement of 80–90%
	5	Achievement of 90–100%
Exercises (C)	**3**	Achievement of 50–60% of assessment requirements
	3,5	Achievement of 60–70%
	4	Achievement of 70–80%
	4,5	Achievement of 80–90%
	5	Achievement of 90–100%
Project (P)	**3**	Achievement of 50–60% of assessment requirements
	3,5	Achievement of 60–70%
	4	Achievement of 70–80%
	4,5	Achievement of 80–90%
	5	Achievement of 90–100%

5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

Category	**Student's workload**	
	Full-time studies	**Extramural studies**
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER / CONTACT HOURS/	***75***	
*Participation in lectures**	*30*	
*Participation in classes, seminars, laboratories**	*30*	
Projekt	*15*	
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/	***50***	

*Preparation for the lecture**	*15*	
*Preparation for the classes, seminars, laboratories**	*30*	
*Preparation for the exam/test**	*5*	
TOTAL NUMBER OF HOURS	***125***	
ECTS credits for the course of study	**5**	

***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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