COURSE DESCRIPTION CARD - SYLLABUS

Course name

Elective course A: Nuclear Physics

Course

Field of study	Year/Semester
Power Engineering	3/6
Area of study (specialization)	Profile of study
Nuclear Power	general academic
Level of study	Course offered in
First-cycle studies	Polish
Form of study	Requirements
full-time	elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	15	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Wydział Inżynierii Materiałowej i Fizyki

Technicznej

Instytut Badań Materiałowych i Inżynierii

Kwantowej

Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge of physics, chemistry and mathematics (program basis for high schools, standard level).

Skills in solving problems in physics based on the knowledge possessed, ability to extract information from the recommended sources.

Understanding of the necessity of extending one’s competences, readiness to cooperate within a team.

Course objective

Transfer of fundamental knowledge in nuclear physics, within the range defined by the program relevant for the field of study. Development of skills in solving elementary problems and performing simple experiments, as well as the analysis of results obtained, based on the knowledge possessed. Development of skills in self-study and team work.

Course-related learning outcomes

Knowledge

1. Student has knowledge in the field of physics, including mechanics, thermodynamics, atomic and nuclear physics and solid state physics, including knowledge necessary to understand the basic physical phenomena occurring in the field of nuclear energy.

2. Student has basic knowledge in the field of nuclear energy including construction of nuclear reactors, mechanisms of nuclear reaction, nuclear power plant failure, calculation methods of reactor physics.

Skills

1. Student can acquire information from literature, databases and other sources; can integrate the obtained information, make their interpretation, as well as apply and formulate and justify opinions.

2. Student can prepare and present a brief presentation of the results of the engineering task.

3. Student has the ability to self-education, among others to improve professional skills.

Social competences

1. Student can get actively involved in solving problems stated, develop and extend his (her) competences unaided.

2. Student can cooperate within a team, fulfill the duties resulting from division of team work, show responsibility for his (her) own work and joint responsibility for the results of team work.

3. Student is aware of the importance and understands the non-technical aspects and effects of the engineer-energy industry, including its impact on the environment, and the related responsibility for decisions.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge:

Lecture: written exam from selected issues in nuclear physics.

Evaluation criteria:

less than 50% - 2.0

50.1%-60.0% - 3.0

60.1%-70.0% - 3.5

70.1%-80.0% - 4.0

80.1%-90.0% - 4.5

from 90.1% - 5.0

Laboratories - student can perform a simulation of atomic and nuclear physics in Mathematica

Evaluation criteria:

student can perform simulations of of physical processes on the basis of clues leading - 3.0

student can independently perform simulations of physical processes and draw correct conclusions - 4.0

student can independently perform simulations of of physical processes, draw correct conclusions and propose their own solution to the problem - 5.0

Programme content

1. Fundamentals of quantum physics - Quantization of Light and The Wavelike Properties of

Particles.

2. Elements of atomic physics.

3. Structure and properties of the atomic nucleus.

4. Methods for determining masses and sizes of nuclei.

5. Nuclear models.

6. Radioactivity - Alpha, Beta, and Gamma Decay.

7. Nuclear reactions.

8. Nuclear fission.

9. Principles of operation of a nuclear reactor.

10. Overview of reactor types.

11. Fundamentals of nuclear fusion

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given in the presentation.

2. Computer laboratories: solving tasks in the field of atomic and nuclear physics in the program environment, eg Mathematica, prepared by the teacher.

Bibliography

Basic

1. D.Halliday, R.Resnick, J.Walker, Podstawy fizyki, tom 5,Wydawnictwo Naukowe PWN, Warszawa 2006

2. T.Mayer-Kuckuk, Fizyka jądrowa, Wydawnictwo Naukowe PWN, Warszawa 1987

3. E.Skrzypczak, Z.Szefliński Wstęp do fizyki jądra atomowego i cząstek elementarnych, Wydawnictwo Naukowe PWN, Warszawa 2002

4. I.E.Irodow, Zadania z fizyki atomowej i jądrowej, PWN

Additional

1. R.Eisberg, R.Resnick, Fizyka kwantowa, Wydawnictwo Naukowe PWN, Warszawa 1983

2. M.Kiełkiewicz, Podstawy fizyki reaktorów jądrowych, WPW

3. P.Tipler, R.Llewellyn, Fizyka współczesna, Wydawnictwo Naukowe PWN, Warszawa 2011

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	3,0
Classes requiring direct contact with the teacher	70	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate