COURSE DESCRIPTION CARD - SYLLABUS

Course name
Nuclear Physics

Course

Field of study
Power Engineering

Year/Semester
2/3

Area of study (specialization)
Nuclear Power

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Instytut Badań Materiałowych i Inżynierii Kwantowej

Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge of physics, chemistry and mathematics, basic knowledge of atomic and nuclear physics.

Skills in solving problems in physics based on the knowledge possessed, ability to extract information from the recommended sources, ability to deepen understanding and interpretation of communicated messages.

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

Course objective

Transfer of expanded knowledge in nuclear physics, elementary particle physics, nuclear reactor physics, thermonuclear fusion prospects and applications of nuclear reactions and interactions. Development of skills in presenting problems in nuclear physics based on the knowledge possessed. Development of skills in self-study and team work.

Course-related learning outcomes

Knowledge

1. Student has expanded knowledge in the field of nuclear physics, elementary particle physics, plasma physics, reactor physics, including knowledge necessary to understand the physical phenomena occurring in the field of nuclear energy.

2. Student has expanded 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 and perspectives of thermonuclear fusion development.

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, including in order to improve professional skills, student can determine the directions of further learning.

Social competences

1. Student is able to actively engage in solving problems, independently develop and expand their competences, recognizes the importance of knowledge in solving cognitive and practical problems in the field of energy.

2. Student understands the need to formulate and provide the society with reliable information and opinions on nuclear energy, presenting different points of view.

3. Student is aware of the importance of behaving in a professional manner 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

Skills and social competencies:

Evaluation of an individual oral presentation prepared in teams.

Programme content

1. Nuclear physics instruments
2. Production and detection of neutrons.
3. Models of nuclear reactions.
4. Fission reactions and nuclear weapons.
5. Physics of nuclear reactors
6. Radioactive waste.
7. Fuel cycle, transmutation and incineration of radioactive waste
8. Applications of nuclear reactions and interactions.
9. Nuclear fusion, obtaining a high-temperature plasma.
10. Prospects of fusion synthesis.
11. Elements of elementary particle physics.

Teaching methods

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

Bibliography

Basic

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

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

3. A.Strzałkowski, Wstęp do fizyki jądra atomowego, PWN, Warszawa (1978)

4. A.Hrynkiewicz, Energia. Wyzwanie XXI wieku, Wyd. UJ, Kraków (2002)

Additional

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

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

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	39	1,0
Student's own work (preparation for exam - using the recommended sources of knowledge) [1]	21	1,0

[1] delete or add other activities as appropriate