POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Nuclear Physics [S2EJ1>FJ]

Course

Field of study
Nuclear Power Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. Magdalena Elantkowska prof. PP
magdalena.elantkowska@put.poznan.pl

Lecturers

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
Tutorials: colloquium.
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:
Additional assessment of student's activity during classes.

Programme content

The lecture assumes basic knowledge in the field of nuclear physics acquired at the first level of education, therefore it discusses selected issues, such as research tools used in nuclear physics, cross-sections in research in the field of nuclear physics, particle acceleration, nuclear models, the basics of nuclear fission according to Bohr and Wheeler, nuclear reactions and the basics and prospects of thermonuclear fusion.

Course topics

1. Nuclear physics instruments.
2. Cross section in nuclear physics research.
3. Particle acceleration.
4. Production and detection of neutrons.
5. Models of nuclear reactions.
6. Basics of nuclear fission according to Bohr and Wheeler
7. Applications of nuclear reactions and interactions.
8. Fission reactions and nuclear weapons.
9. Physics of nuclear reactors.
10. Nuclear fusion, obtaining a high-temperature plasma.
11. Prospects of fusion synthesis.
12. Elements of elementary particle physics.

Teaching methods

Lecture delivered remotely using synchronous access methods.

1. Lecture: multimedia presentation.
2. Solving problems in physics at auditory classes.

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

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	2,00
Classes requiring direct contact with the teacher	45	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50