COURSE DESCRIPTION CARD - SYLLABUS

Course name
Nuclear power engineering [S2ZE1E>EJ]

Course

Field of study
Green Energy

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
english

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

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Prerequisites

Student has basic knowledge of physics, chemistry, fundamentals of electrical power engineering and fundamentals of thermal power engineering. Student is able to solve mass and energy balance equations in the elementary thermal cycle.

Course objective

Acquiring basic knowledge in the field of physics of nuclear power reactors and becoming familiar with currently available technologies used in nuclear energy.

Course-related learning outcomes

Knowledge:
1. Student understands the essence of phenomena occurring in nuclear reactor core.
2. Has a basic knowledge of the construction of power reactors.
3. Knows basic technical solutions to ensure safe operation of a nuclear power plant.

4. Understands the environmental impact of a nuclear power plant.

Skills:
1. Is able to perform basic criticality calculations for a nuclear reactor.
2. Is able to apply theoretical knowledge to solve reactor physics problems.
3. Is able to describe and characterize the basic operations of a nuclear power plant.
4. Is able to describe and calculate thermal cycles for power plants with different types of nuclear reactors.

Social competences:
1. Is aware of the high responsibility of a power engineer in a nuclear power plant to make decisions.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

LECTURE
Assessment of knowledge and skills in the written test at the last lecture.
TUTORIALS
Assessment on systematic verification of knowledge, activity during tutorials and written colloquium on calculus tasks.
LABORATORY CLASSES
Evaluation based on ongoing reviews and completed reports.

Programme content

LECTURE
Nuclear fuels and their properties. Fission of uranium nucleus, fission fragments, fission energy, radioactive chains of fission fragments. Interaction of neutrons with matter, active cross sections, slowing down and escape of neutrons. Neutron life cycle, reactor criticality conditions. Neutron balance equation of a reactor. Construction of nuclear reactors. Operation of nuclear reactors. Safety systems used in nuclear power plants. Fuel cycle. Waste disposal.
TUTORIALS
Energy analysis of technological systems of nuclear units.
LABORATORY CLASSES
Modeling and analysis of nuclear power units. Investigation of operating parameters with the use of nuclear power unit simulator.

Teaching methods

LECTURE
Multimedia presentation supplemented by examples given on the blackboard.
TUTORIALS
Calculus tasks counted on the blackboard.
LABORATORY CLASSES
Classes conducted with the use of specialized software.

Bibliography

Basic:
Glasstone S., Principles of Nuclear Reactor Engineering, D. Van Nostrand Company, Inc.
Lamarsh J. R., Introduction to Nuclear Engineering, Prentice Hall
Oka Y., Nuclear Reactor Design, Springer
Celiński Z., Strupczewski A., Podstawy energetyki jądrowej, WNT
Ackermann G., Eksploatacja elektrowni jądrowych, WNT

Additional:
Meiswinkel R., Meyer J., Schnell J.,Design and Construction of Nuclear Power Plants, Ernst & Sohn GmbH
Kubowski J., Elektrownie jądrowe, WNT
Kiełkiewicz M., Teoria reaktorów jądrowych, WNT

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50