COURSE DESCRIPTION CARD - SYLLABUS

Course name
Cooperation of nuclear power plants with the power grid [S2EJ1>WEJ]

Course

Field of study
Nuclear Power Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Student has basic knowledge of technologies and energy machines used in the professional power industry, fluid mechanics, and basics of metrology. Understands the principles of operation of basic machine parts and knows the structure of basic nuclear energy devices: reactors, steam turbines, heat exchangers, pumps. Knows the thermal systems of nuclear power plants. He is aware of the need to expand his competences and is ready to cooperate within a team.

Course objective

Acquiring knowledge of the issues and specifics of the operation of a nuclear power plant in the power system.

Course-related learning outcomes

Knowledge:
1. Has general knowledge of ways to optimize the operation of generation sources in the power system.
2. Knows technical and economic indicators describing the results of operation of nuclear power plants.
3. Has knowledge of the system for distributing electrical power from a nuclear power plant to the power system and the system for supplying own needs.

Skills:
1. Student is able to apply the basic principles of proper operation of generating sources in the power system.
2. Student is able to determine the values of technical and economic indicators of a nuclear power plant.
3. Distinguishes the methods of operation of a nuclear power plant in the power system.

Social competences:
1. Student is aware of the impact of the operation of a nuclear power plant on the safety and stability of the power system.
2. Student is aware of the need for dialogue with people and organizations skeptical about nuclear energy.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
Continuous assessment in each class (rewarding activity).
- assessment of knowledge and skills demonstrated in a problem-based written exam
Laboratory classes
Assessment of knowledge and skills related to the implementation of the exercise task, assessment of the report on the exercise performed.
- obtaining additional points for the ability to cooperate as part of a team that practically implements a detailed task in the laboratory and aesthetic care of the prepared reports

Programme content

Lecture
Structure of the power system, load variability in the power system. System sources. Energy characteristics and relative increases of generation sources. Operation of a nuclear power plant in the power system - economic load distribution, selection of a set of generating units. The role of different types of power plants in the operation of the power system. Operational flexibility of nuclear power plants. Electrical systems: power output from the power plant to the power system and supplying the nuclear power plant's own needs. Regulation of power fed into the power system. Nuclear power plant in emergency shutdown conditions. Conditions for rebuilding the generating capacity of a nuclear power plant. Flexibility of operation of power units of nuclear power plants. Operational indicators of a nuclear power plant.
Laboratory classes
Generator synchronization procedure with the power grid - C-PWR simulator Determining the values of technical and economic indicators of nuclear power plant equipment in the Ebsilon Proffessional program.

Teaching methods

Lecture delivered remotely using synchronous access methods.
Lecture:
Multimedia presentation.
Laboratory classes:
Classes carried out at a computer station with a C-PWR block simulator Classes conducted at computer workstations using EBSILON Professional software.

Bibliography

Basic:
1. Gładyś H., Matla R., Praca elektrowni w systemie elektroenergetycznym, WNT Warszawa, 1995,
2. Ackermann G., Eksploatacja elektrowni jądrowych WNT 1987
3. Sierchuła J. Rozruch elektrowni jądrowej na przykładzie symulatora C-PWR. Poznań University of technology Academic Journals, Electrical Engineering 2016

Additional:
1. Pawlik M., Strzelczyk F., Elektrownie, WNT Warszawa, 20173. Murray R.L., Nuclear Energy (6th Ed.),

Elsevier, Amsterdam 2009.
2. Nowicki J. Część elektryczna elektrowni jądrowej, Ministerstwo Energii, Warszawa 2017
3. Sierchuła J. Wielokryterialna analiza porównawcza jednostek wytwórczych w elektrowniach jądrowych i konwencjonalnych na wybranych przykładach. Przeglad Elektrotechniczny, 2016
4. Sokólski, P.; Rutkowski, T.A.; Ceran, B.; Złotecka, D.; Horla, D. The Influence of Cooperation on the Operation of an MPC Controller Pair in a Nuclear Power Plant Turbine Generator Set. Energies 2022, 15, 6702. doi: 10.3390/en15186702

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00