COURSE DESCRIPTION CARD - SYLLABUS

Course name
Construction in nuclear energy [S2EJ1>BwEJ]

Course

Field of study
Nuclear Power Engineering

Year/Semester
1/2

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
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

1. Knowledge: The student knows the basics of material strength, including the calculation of physical and geometric characteristics of plane sections and stresses in the structure. Student knows the theoretical course of the construction process and has the ability to prepare construction drawings in CAD programs. The student has basic knowledge of materials used in construction. The student is able to determine the basic strength parameters of selected simple structure elements. 2. Skills: The student is able to identify weak points of the structure based on the mechanics of plane structure systems. Knowledge of AutoCAD software. 3. Social competences: The student is aware of the seriousness of the investment process and the essence of investing in strategic facilities in the country. Student is able to work in a team and is sensitive to the needs of colleagues when carrying out joint design exercises in groups. Student knows the basics of design and implementation guidelines in accordance with the technical conditions for acceptance and execution of construction works.

Course objective

The subject presents the possibilities of using modern materials used in the construction and operation of nuclear energy facilities. The knowledge taught concerns objects constructed in various places around the world. In particular, it is related to modern building and shielding materials in the nuclear energy sector. Contemporary directions in the development of covering and protective materials ensuring maximum safety for facility users are also discussed.

Course-related learning outcomes

Knowledge:
Knowledge of the latest trends in nuclear energy construction, with particular emphasis on case studies of selected power plants. Knowledge in the construction of reactor casing elements and extreme, rare loads.

Skills:
Ability to define weak points of basic elements of reactor structures, including surrounding buildings. Identification of the risk of possible threats unique to strategic structures.

Social competences:
Ability to work effectively in a group to accomplish a key task assigned to the project team.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:
Passing the subject will be in the form of a written exam.
Laboratory:
Design exercise with an individual project or a team project.

Programme content

1. Construction in Nuclear Power Plant (NPP) - introduction
2. Characteristics of the construction process in nuclear power plants in examples of existing power plants
3. Description of the basic tasks of the construction process during the construction and operation of the NPP
4. Basics of urban design of nuclear power plants
5. Safety of selected elements of the NPP structure
6. Design of main structural elements vs. protective elements in NPP facilities.
7. Cont. - design of reactor shields - load characteristics
8. Cont. - design of additional elements - load characteristics
9. Cont. - exceptional and extreme loads
10. Cont. - modern methods of analysis in the design of nuclear power plants
11. Cont. - modern methods of analysis in the design of nuclear power plants
12. Diagnostics of the condition and quality of building elements of structures during NPP lifecycle
13. Designing an algorithm for construction works, including the indication of key project milestones and taking into account basic risks, including the acceptance of disappearing works
14. Exceptional structural safety, extreme loads, basic knowledge of the structural mechanics of nuclear energy facilities.

Course topics

none

Teaching methods

Lecture delivered remotely using synchronous access methods.
Informative lecture with multimedia presentation.
Computer laboratory: problem method, case analysis, project method, team work

Bibliography

Basic:
1. ACI CODE-349-13 Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary
2. Handbook of Nuclear Engineering, Dan G. Cacuci, 2010 p.3574
3. Design and Construction of Nuclear Power Plants, Rudiger Meiswinkel, Julian Meyer, Jurgen Schnell, Ernst&Sogn Willey 2013, p.142
4. Budownictwo w technice jądrowej, Ablewicz Z., Józnik. B. 1978 Warszawa

Additional:
1. The U.S. Nuclear Regulatory Commission (NRC), www.nrc.gov
2. PE Nuclear Reference Handbook Version 1.2, 2019, p.511

Breakdown of average student's workload

	Hours	ECTS
Total workload	107	4,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,50