COURSE DESCRIPTION CARD - SYLLABUS

Course name
Storage of radioactive waste [S2EJ1>SOzEJ]

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
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Mathematics: algebraic functions, equations and systems of equations, basics of probability calculus, solving algebraic equations and systems of equations. Physics: principles of conservation in physics, nuclear physics, types of ionizing radiation, impact of ionizing radiation on matter and biological systems, basic knowladge of radiation protection.

Course objective

Acquiring knowledge and skills in the field of nuclear physics, impact of technical appication of radiation sources on the environment, methods of assessing risks related to the using radiation and radioisotopes.

Course-related learning outcomes

Knowledge:
1. The student knows the safety rules used in radiation protection
2. The student knows and understands the risc of using adiation and radioisotopes.
3. The student has knowledge of the potential impact of ionazing radiation and radioactive waste on the environmental system.
4. The student knows the barriers that prevent radioactive substances from entering the environment.

5. The student knows the International Nuclear Emergency Scale (INES) and understands its application.
6. The student has knowledge of the methodology for calculating the reliability of technical systems, knows the basic reliability structures and understands their properties.
7. The student knows the probabilistic risk assessment (PRA) methodology and its application to assess the safety of ionazing radiation and radioactive waste .

Skills:
1. The student is able to estimate the reliability of a simple radiation safety system.
2. The student is able to calculate doses from radiactive sources and waste.
3. The student is able to calculate the reliability of a complex technical structure of radiaton protection and indicate ways to improve reliability.
4. Knowledge of issues related to: basics of nuclear physics, types of ionizing radiation, the impact of ionizing radiation on matter, the basics of radiological protection.

Social competences:
1. The student understands the need for teamwork in solving theoretical and practical problems of nuclear energy, nuclear waste and radiation protection.
2. The student understands the need to systematically deepen and expand his knowledge and skills.
3. The student is aware of the need for social dialogue on matters related to the impact of nuclear energy, nuclear waste and radiation protection.on the environment

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures
The final grade results from the student's activity during lectures and knowladge test in written assessment or multimedia form (multimedia presentation).

Programme content

Lectures
1. Elements of the uranium fuel cycle. 2. The process of burning fuel in the reactor. 3. Temporary storage of spent fuel. 4. Open and closed cycle. 5. Spent fuel processing. 6. Handling of high-level waste generated in the process of spent fuel processing. 7. Storage of spent fuel without reprocessing. 8. Final disposal of spent fuel and high-level waste from nuclear reactors - an overview of technical solutions in the world. 9.Elements of the Polish Nuclear Energy Programme.

Course topics

Elements of the uranium fuel cycle. The process of burning fuel in the reactor. Temporary storage of spent fuel. Open and closed cycle. Spent fuel processing. Handling of high-level waste generated in the process of spent fuel processing. Storage of spent fuel without reprocessing. Final disposal of spent fuel and high-level waste from nuclear reactors - an overview of technical solutions in the world.Some elements of the Polish Nuclear Energy Programme.

Teaching methods

Lecture delivered remotely using synchronous access methods.
Lectures: multimedia presentation (including drawings, photos, animations) supplemented with explanations provided on the blackboard.

Bibliography

Basic:
1. W.Gorączko, Ochrona radiologiczna, Politechnika Poznańska, Poznań, 2011. 2. W.Gorączko, Elementy chemii jądrowej, Politechnika Poznańska, Poznań 2012. 3. W.Gorączko, Radiochemia i ochrona radiologiczna, Politechnika Poznańska, Poznań, 2003. 4. W.Szymański, Chemia jądrowa, PWN, Warszawa, 1999. 5. Prawo atomowe, Ustawa z dnia 29 listopada 2000 r i z 2001 r. z uwzględnieniem tekstu jednolitego z 14 lutego 2007 r. (Dz. U. Nr 42, poz. 276) z późniejszymi zmianami.

Additional:

1. A.Hrynkiewicz, Człowiek i promieniowanie jonizujące, PWN, Warszawa, 2001. 2. A.Vertes, I.Kiss, Nuclear chemistry, Akademia Kiado, Budapest, 1987. 3. Principles of radiochemistry, H.Kay, Butterworths, London, 1985. 4. AREVA book - Od Atomu do Cyrkonu, Paris, 2010. 5. Nuclear Engineering Handbook Edited By Kenneth D. Kok Edition 2nd Edition First Published 2016 eBook Published 29 September 2016 Pub. Location Boca Raton Imprint CRC Press DOI

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