GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Nuclear fuels and fuel cycle, PG_00065881		
Field of study	Nuclear Engineering		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Dąbrowski	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	15	4.0	6.0	25

Subject objectives

The subject aims to familiarize students with the fuel cycle from the extraction of radioactive ores to the storage of spent nuclear fuel. In addition, the course aims to introduce students to the types of nuclear fuels. This course will teach students how nuclear fuel is produced, what forms of fuel rods are used in nuclear power plants and what safety measures are taken at each stage of the fuel cycle.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of study	Student verifies potential fuel cycles for use in a nuclear power plant	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W12] identifies and interprets the main developmental trends and significant new achievements in the field of engineering and technical sciences and disciplines relevant to the course of study	The student explains aspects of storage, processing, and recycling of nuclear spent fuel	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Nuclear Power Technologies, the physics of processes, structure, principle of operation, operation, safety aspects, fuels and materials for reactors, systems, machines and devices of a nuclear power plant	Student compares different types of nuclear fuels	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation

<table>
<tr><td>Subject contents</td><td>Course content – lecture

1. Fuel cycle - main idea, types, basic concept
2. Production of nuclear fuel - extraction, enrichment and processing of radioactive elements
3. Types and forms of nuclear fuel
4. Construction of fuel elements
5. Energy transformation in a nuclear reactor
6. Transport, storage, processing and recycling of spent fuel
7. Fuel cycle safety</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>The knowledge of basic thermodynamic concepts and heat and mass transfer issues.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Lecture - written test</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>1. Wilson, P.D. (ed.), The Nuclear Fuel Cycle from Ore to Wastes (Oxford, 1996; online edn, Oxford Academic, 31 Oct. 2023) DOI: 10.1093/oso/9780198565406.001.0001
2. Taylor R. (ed.), Reprocessing and Recycling of Spent Nuclear Fuel, Woodhead Publishing 2015 DOI: 10.1016/C2013-0-16483-5</td></tr><tr><td>Supplementary literature</td><td>1. Kathryn D. Huff, Chapter One - Economics of Advanced Reactors and Fuel Cycles, Editor(s): Hitesh Bindra, Shripad Revankar, Storage and Hybridization of Nuclear Energy, Academic Press, 2019, DOI: 10.1016/B978-0-12-813975-2.00001-6</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Definitions: fuel cycle, fuel rod, radioactive element
2. Describe the selected fuel cycle
3. Describe the methods of extracting ores of radioactive elements
4. What is uranium enrichment?
5. What is the difference between processing and recycling of nuclear fuel?
6. Describe safety measures in the fuel cycle</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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