

## Subject card

|                                             |                                                                                                                                                 |                                                          |                                         |                                     |                        |            |     |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|------------------------|------------|-----|
| Subject name and code                       | Nuclear energy, PG_00080774                                                                                                                     |                                                          |                                         |                                     |                        |            |     |
| Field of study                              | Chemical Business, Chemistry, Environmental Protection                                                                                          |                                                          |                                         |                                     |                        |            |     |
| Date of commencement of studies             | October 2026                                                                                                                                    |                                                          | Academic year of realisation of subject |                                     | 2028/2029              |            |     |
| Education level                             | Bachelor's studies                                                                                                                              |                                                          | Subject group                           |                                     | Optional subject group |            |     |
| Mode of study                               | full-time studies                                                                                                                               |                                                          | Mode of delivery                        |                                     | at the university      |            |     |
| Year of study                               | 3                                                                                                                                               |                                                          | Language of instruction                 |                                     | English                |            |     |
| Semester of study                           | 6                                                                                                                                               |                                                          | ECTS credits                            |                                     | 2.0                    |            |     |
| Learning profile                            | academic                                                                                                                                        |                                                          | Assessment form                         |                                     | credit                 |            |     |
| Conducting unit                             | Laboratory of Toxicology and Radiation Protection -> Department of Environmental Chemistry and Radiochemistry -> Faculty of Chemistry -> Rector |                                                          |                                         |                                     |                        |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                              |                                                          | dr Grzegorz Olszewski                   |                                     |                        |            |     |
|                                             | 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                                                                                                                  |                                                          |                                         |                                     |                        |            |     |
|                                             | Additional information:<br><br>Lecture                                                                                                          |                                                          |                                         |                                     |                        |            |     |
| 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                                                       |                                         | 2.0                                 |                        | 33.0       | 50  |
| Subject objectives                          | To familiarize students with the basics of nuclear chemistry and physics and a possible civil and military use of the nuclear energy            |                                                          |                                         |                                     |                        |            |     |

| Learning outcomes               | Course outcome                                                                                                                                                                                                                                                                                                                                    | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Method of verification                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
|                                 | [CHEML3_W05] Has basic knowledge of the chemical specialisation studied.                                                                                                                                                                                                                                                                          | <p>knows the history of nuclear energy and understands the basic concepts of radioactivity, radiation protection and radiotoxicity,</p> <p>understands the concepts of neutron reactions, nuclear fission, nuclear fusion, chain reactions,</p> <p>knows the types of nuclear power plants and understands the reactor theory,</p> <p>has knowledge on the nuclear fuel cycle including nuclear reactor chemistry and nuclear waste disposal,</p> <p>has the basic knowledge on nuclear reactor safety and security,</p> <p>has the basic knowledge on nuclear weapons and nuclear propulsion.</p> | [SW4] test/exam - oral or written            |
|                                 | [CHEML3_U09] Is able to learn independently.                                                                                                                                                                                                                                                                                                      | Demonstrates the ability to independently search for scientific literature and specialized textbooks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | [SU1] oral statement/conversation/discussion |
|                                 | [CHEML3_K07] Appreciates the need for understandable presentation of selected chemical issues to the public.                                                                                                                                                                                                                                      | can transfer knowledge in the society about the nuclear energy,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | [SK1] oral statement/conversation/discussion |
|                                 | [CHEML3_K01] Identifies the level of her/his own knowledge and skills and the need for continuous learning and personal development.                                                                                                                                                                                                              | understands the need for further education in the field of nuclear energy due to its constant development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | [SK1] oral statement/conversation/discussion |
|                                 | [CHEML3_K03] Establishes priorities in the right way for the implementation of tasks specified by herself/himself and/or by others.                                                                                                                                                                                                               | acquires the ability to properly organize time in independently mastering the course material                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | [SK1] oral statement/conversation/discussion |
|                                 | [CHEML3_U07] Prepares documented elaboration on a specific problem in the field of selected chemical and physical issues.                                                                                                                                                                                                                         | <p>demonstrates scientific competence in nuclear energy civil use</p> <p>is able to give concepts of chemistry and physics behind nuclear energy operation,</p> <p>recognizes the principles of nuclear reactors operation,</p> <p>can assess the radiological impact of nuclear energy use,</p> <p>is able to assess safety of nuclear energy</p>                                                                                                                                                                                                                                                 | [SU1] oral statement/conversation/discussion |
|                                 | [CHEML3_K08] Formulates opinions in the field of science with caution and criticism in their expression.                                                                                                                                                                                                                                          | is able to identify the positive and negative sides of using nuclear energy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | [SK1] oral statement/conversation/discussion |
| Subject contents                | Nuclear power development, atoms and nuclei, radioactivity, basics of radiation protection and radiotoxicity, nuclear fission, nuclear fusion, chain reactions, reactor theory, types of nuclear power plants, nuclear fuel cycle, reactor chemistry, nuclear safety and security, nuclear waste disposal, nuclear propulsion and nuclear weapons |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                              |
| Prerequisites and co-requisites |                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                              |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                                                                          | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Percentage of the final grade                |
|                                 | Test                                                                                                                                                                                                                                                                                                                                              | 50.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 100.0%                                       |
| Recommended reading             | Basic literature                                                                                                                                                                                                                                                                                                                                  | <p>Bodansky D., Nuclear Energy, Principles, Practices and Prospects, Springer, 2004,</p> <p>Murray R.L., Holbert K.E., Nuclear Energy, Elsevier, 2020.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                              |

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|----------------------------------------------------------------|--------------------------|------|
|                                                                | Supplementary literature | None |
|                                                                | eResources addresses     |      |
| Example issues/<br>example questions/<br>tasks being completed |                          |      |
| Work placement                                                 | Not applicable           |      |

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