



## Subject card

|                                             |                                                                                                                                                                                                                                                                   |                                                          |                                                                                                                                                          |                                     |                                                                      |            |     |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Selected topics of Environmental Protection in Industry , PG_00066049                                                                                                                                                                                             |                                                          |                                                                                                                                                          |                                     |                                                                      |            |     |
| Field of study                              | Engineering and Technologies of Energy Carriers                                                                                                                                                                                                                   |                                                          |                                                                                                                                                          |                                     |                                                                      |            |     |
| Date of commencement of studies             | February 2027                                                                                                                                                                                                                                                     |                                                          | Academic year of realisation of subject                                                                                                                  |                                     | 2027/2028                                                            |            |     |
| Education level                             | second-cycle studies                                                                                                                                                                                                                                              |                                                          | Subject group                                                                                                                                            |                                     | Optional subject group<br>Humanistic-social subject group            |            |     |
| Mode of study                               | Full-time studies                                                                                                                                                                                                                                                 |                                                          | Mode of delivery                                                                                                                                         |                                     | at the university                                                    |            |     |
| Year of study                               | 1                                                                                                                                                                                                                                                                 |                                                          | Language of instruction                                                                                                                                  |                                     | Polish                                                               |            |     |
| Semester of study                           | 2                                                                                                                                                                                                                                                                 |                                                          | ECTS credits                                                                                                                                             |                                     | 3.0                                                                  |            |     |
| Learning profile                            | practical profile                                                                                                                                                                                                                                                 |                                                          | Assessment form                                                                                                                                          |                                     | assessment                                                           |            |     |
| Conducting unit                             | Department of Process Engineering and Chemical Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology                                                                                                                                 |                                                          |                                                                                                                                                          |                                     |                                                                      |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                |                                                          | dr hab. inż. Patrycja Makoś-Chełstowska                                                                                                                  |                                     |                                                                      |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                          |                                                          |                                                                                                                                                          |                                     |                                                                      |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                       | Lecture                                                  | Tutorial                                                                                                                                                 | Laboratory                          | Project                                                              | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                             | 20.0                                                     | 0.0                                                                                                                                                      | 30.0                                | 0.0                                                                  | 0.0        | 50  |
|                                             | 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                                                                                                                                                                                                                                             | 50                                                       |                                                                                                                                                          | 10.0                                |                                                                      | 15.0       | 75  |
| Subject objectives                          | Presentation of issuesof environmental protection in relation to industry - in the field of applied technologies for environmental protection, monitoring of pollutant emissions as well as related to environmental impact assessment and related legal aspects. |                                                          |                                                                                                                                                          |                                     |                                                                      |            |     |
| Learning outcomes                           | Course outcome                                                                                                                                                                                                                                                    |                                                          | Subject outcome                                                                                                                                          |                                     | Method of verification                                               |            |     |
|                                             | [K7_K05] is able to assess social problems related to the energy economy                                                                                                                                                                                          |                                                          | The student is able to identify and analyze the impact of environmental protection technologies and renewable energy sources on society and the economy. |                                     | [SK5] Assessment of ability to solve problems that arise in practice |            |     |
|                                             | [K7_W04] explains the relationships in the life cycle of technical devices and the basic processes occurring in the life cycle of devices, objects and technical systems,                                                                                         |                                                          | The student understands and is able to describe the life cycle of renewable energy technologies and their impact on the environment in various phases.   |                                     | [SW3] Assessment of knowledge contained in written work and projects |            |     |
|                                             | [K7_U03] uses analytical, simulation and experimental methods of chemistry, physics and chemical engineering and technology to formulate and solve complex engineering tasks, including non-standard tasks, as well as simple research problems                   |                                                          | The student is able to apply methods of analysing pollutant emissions and assessing the impact of technologies on the environment.                       |                                     | [SU4] Assessment of ability to use methods and tools                 |            |     |
|                                             | [K7_K02] is able to cooperate and work in a group, taking on different roles                                                                                                                                                                                      |                                                          | The student actively participates in team-based analysis of environmental protection technologies and prepares a report.                                 |                                     | [SK1] Assessment of group work skills                                |            |     |

|                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                           |                               |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Subject contents                                         | Course content – lecture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                           |                               |
|                                                          | 1. Types of impact on environment and sources of environmental pollution in the industry<br>2. Physio-chemical basics of phenomena and technologies used for treatment of waste gases<br>3. Physio-chemical basics of phenomena and technologies used for treatment of water and wastewater<br>4. Remediation of polluted soils<br>5. Waste disposal and management<br>6. Review of legal acts related to environmental protection<br>7. Environmental management according to ISO 14001<br>8. Basics of environmental impact assessment<br>9. Production-integrated environmental protection in the chemical industry<br>10. A review of environmental aspects for selected industrial companies                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                           |                               |
|                                                          | Course content – laboratory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                           |                               |
|                                                          | 1)Technologies used in waste gas treatment<br>2) Water and wastewater treatment technologies<br>3) Remediation of contaminated soil<br>4) Waste disposal technologies<br>5) Visit to a waste disposal plant in Gdańsk for a practical introduction to the problem of odor nuisance and techniques for its identification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                           |                               |
| Prerequisites and co-requisites                          | Knowledge about general, organic, inorganic, physical and analytical chemistry as well as physics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                           |                               |
| Assessment methods and criteria                          | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Passing threshold                                                                                                                                                                                                                                                                                         | Percentage of the final grade |
|                                                          | Written test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 60.0%                                                                                                                                                                                                                                                                                                     | 60.0%                         |
|                                                          | Rating from the laboratory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 60.0%                                                                                                                                                                                                                                                                                                     | 40.0%                         |
| Recommended reading                                      | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | C. Christ (ed.), Production-integrated environmental protection and waste management in the chemical industry, WILEY-VCH, 1999<br><br>J.A. Tomaszek, P. Koszelnik, Progress in environmental engineering, CRC press, 2015<br><br>Standard ISO 14001<br><br>Legal acts related to environmental protection |                               |
|                                                          | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Scientific publications related to the subject.<br><br>Reports of environmental impact assesment.<br><br>Environmental reports.                                                                                                                                                                           |                               |
|                                                          | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                           |                               |
| Example issues/ example questions/ tasks being completed | Phytoremediation: Definition, Mechanisms (e.g., Phytoextraction) Principles of Operation, Examples<br>Factors Influencing the Selection of Soil Remediation Methods<br>Gas Stream Deodorization Methods: Fundamental Concepts, Comparative Analysis in Terms of Cost, Gas Flow Rate, and Efficiency<br>Biological Methods for Gas Purification<br>Methods for Cleaning Exhaust Gases (Types, Principles of Operation, Efficiency)<br>Environmental Protection Strategies in Industry<br>Cleaner Production: Definition, Core Principles, and Main Assumptions<br>Best Available Techniques (BAT): Definition, Core Principles, and Main Assumptions<br>Physical Methods of Wastewater Treatment Objectives, Techniques, and Efficiency<br>Chemical Methods of Wastewater Treatment Objectives, Techniques, and Efficiency (Coagulation, Flocculation, Advanced Oxidation of Contaminants)<br>Biological Methods of Wastewater Treatment Aerobic and Anaerobic Processes |                                                                                                                                                                                                                                                                                                           |                               |
| Practical activites within the subject                   | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                           |                               |

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