GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|---|---|---|---|
| Subject name and code | Environmental Remediation Technologies, PG_00036294 | | | | | | |
| Field of study | Green Technologies | | | | | | |
| Date of commencement of studies | October 2021 | | Academic year of realisation of subject | 2023/2024 | | | |
| Education level | first-cycle studies | | Subject group | Obligatory subject group in the field of study<br>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 | 3 | | Language of instruction | Polish | | | |
| Semester of study | 6 | | ECTS credits | 3.0 | | | |
| Learning profile | general academic profile | | Assessment form | assessment | | | |
| Conducting unit | Department of Process Engineering and Chemical Technology -> Faculty of Chemistry | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Anna Zielińska-Jurek | | | | | |
| | Teachers | | | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 0.0 | 30.0 | 0.0 | 0.0 | 45 |
| | 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 | 45 | | 2.0 | 28.0 | | 75 |
| Subject objectives | The soil remediation methods will be studied during the lectures and laboratories, depending on the type of contamination and the planned remediation technology. In detail, the students will become familiar with the main sources of soil contamination and the properties of three basic groups of soil pollutants, i.e., petroleum substances, pesticides, and heavy metals. During lectures and practical classes in the laboratory, they learn about physicochemical, biological and thermal methods used to remove contaminants from the soil matrice. | | | | | | |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W03] has a basic knowledge of soil, air and water pollutants, design and supervision of environmentally friendly technologies and technologies which do not produce waste, knows technology of cleaning and neutralization of industrial waste and wastewater management, has a basic understanding of the theoretical basis of methods and types of apparatus used in chemical analysis of environmental pollutants | the student can classify environmental pollutants, assess their impact on living organisms and take action to prevent the migration of pollutants into the environment. The student can select a method soil treatment to the type of contamination and assess the costs associated with the use of a given remediation method. | [SW3] Assessment of knowledge contained in written work and projects<br>[SW1] Assessment of factual knowledge |
| [K6_U02] is able to operate equipment and perform typical analyzes of studies of environmental pollution, is able to carry out an analysis of typical environmental pollution and simple devices according to specification | knowledge in the field of soil and land remediation technologies | [SU4] Assessment of ability to use methods and tools<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU2] Assessment of ability to analyse information<br>[SU1] Assessment of task fulfilment |
| [K6_W04] is aware of the importance of environmental protection and has a basic knowledge of chemical and biological threats to the environment, with particular emphasis on anthropogenic factors, has a basic knowledge of knowledge of the principles of sustainable development as well as national and European environmental management conditions. | knowledge of soil and land remediation methods using physicochemical, biological, thermal and chemical methods | [SW3] Assessment of knowledge contained in written work and projects<br>[SW1] Assessment of factual knowledge |

## Subject contents

Sources and types of soil contamination.

Characteristics of pollutants: pesticides, heavy metals, radionuclides, pharmaceuticals

The characteristics of the soil. Soil sorption: mechanical, physical, chemical and biological. Spreading harmful substances into the environment.

Soil reclamation - definitions and basic tasks of the process. Classification of soil remediation methods.

Physico-chemical methods of soil reclamation in ex-situ conditions

Physico-chemical methods of soil reclamation in in-situ conditions.

Advanced oxidation processes

Biological methods of soil reclamation used in ex-situ and in-situ conditions

Thermal methods of soil reclamation in in-situ and ex-situ conditions

## Prerequisites and co-requisites

Knowledge of basic issues in inorganic, organic and analytical chemistry.

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| zaliczenie ćwiczeń (wszystkich) | 60.0% | 40.0% |
| zaliczenie (dwa kolokwia w trakcie semestru, obydwa muszą być zaliczone) | 60.0% | 60.0% |

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| Recommended reading | Basic literature | 1. Zaleska A., Zielińska-Jurek A., Technologie remediacji gruntów. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2013<br>2. Kowalik P., Ochrona środowiska glebowego, PWN, Warszawa, 2001.<br>3. Zadroga B., Olańczuk-Neyman K., Ochrona i rekultywacja podłoża gruntowego, Wydawnictwo Politechniki Gdańskiej, 2001. |
| | Supplementary literature | publications from Elsevier database. |
| | eResources addresses | Adresy na platformie eNauczanie:<br>Technologie remediacji środowiska (2023/2024) - Moodle ID: 35188 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35188<br>Technologie remediacji środowiska (2023/2024) - Moodle ID: 35188 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35188 |
| Example issues/ example questions/ tasks being completed | Classification of pollutants<br>Methods of soil remediation contaminated with heavy metals<br>Methods of soil remediation contaminated with petroleum substances<br>Methods of soil remediation contaminated with pesticides<br>Scheme of procedure for determining the scope of recultivation of contaminated soil | |
| Work placement | Not applicable | |