



## Subject card

|   |   |  |   |                                     |  |            |     |
|---|---|--|---|-------------------------------------|--|------------|-----|
| Subject name and code                       | Waste managment and waste disposal, PG_00057719   |  |   |                                     |  |            |     |
| Field of study                              | Green Technologies  |  |   |                                     |  |            |     |
| Date of commencement of studies             | October 2022  |  | Academic year of realisation of subject |                                     | 2024/2025  |            |     |
| Education level                             | first-cycle studies   |  | Subject group                           |                                     | Optional subject group<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                            |                                     | 6.0  |            |     |
| Learning profile                            | general academic profile  |  | Assessment form                         |                                     | exam   |            |     |
| Conducting unit                             | Faculty of Chemistry  |  |   |                                     |  |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor  |  | dr inż. Ilona Kłosowska-Chomiczewska    |                                     |  |            |     |
|   | Teachers  |  | dr inż. Ilona Kłosowska-Chomiczewska    |                                     |  |            |     |
|   |   |  | dr inż. Aneta Pacyna-Kuchta             |                                     |  |            |     |
| Lesson types and methods of instruction     | Lesson type   | Lecture  | Tutorial                                | Laboratory                          | Project  | Seminar    | SUM |
|   | Number of study hours   | 30.0   | 0.0                                     | 15.0                                | 15.0   | 0.0        | 60  |
|   | 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   | 60   |   | 5.0                                 |  | 85.0       | 150 |
| Subject objectives                          | The aim of the course is to familiarize the student with the history, legal, technical and technological aspects related to the waste management and waste disposal |  |   |                                     |  |            |     |

| Learning outcomes               | Course outcome   | Subject outcome  | Method of verification  |
|---------------------------------|--|--|---|
|                                 | [K6_U01] is able to obtain information from literature, databases and other sources, is able to integrate the information obtained, to make their interpretation, as well as draw conclusions and formulate and justify opinions, take part in the discussion  | Student is able to obtain information from literature, databases and other sources, is able to integrate the information obtained, to make their interpretation, as well as draw conclusions and formulate and justify opinions, take part in the discussion   | [SU4] Assessment of ability to use methods and tools<br>[SU5] Assessment of ability to present the results of task<br>[SU1] Assessment of task fulfilment<br>[SU3] Assessment of ability to use knowledge gained from the subject |
|                                 | [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 has basic knowledge of scope of friendly technologies for the environment and technology waste-free. He has knowledge on topic currently used solutions in the field waste management, especially in the European Union.   | [SW2] Assessment of knowledge contained in presentation<br>[SW1] Assessment of factual knowledge  |
|                                 | [K6_U04] capable of formulating and solving design tasks in the field of environmental technology to recognize their non-technical aspects, including environmental, economic and legal. Is capable of applying the principles of occupational health and safety. Is able to make initial assessment of engineering solutions and actions  | The student is able to start a discussion regarding waste management, and present your point of view. He is consistent in carrying out the tasks entrusted to him, updates knowledge regarding the latest solutions in scope of economy and waste disposal, understands the need for updates knowledge in this area. Student knows and can apply basic rules occupational health and safety applicable in technologies environmental protection. Student has basic knowledge in the field technology design environmentally friendly and basic methods analytical. | [SU5] Assessment of ability to present the results of task<br>[SU4] Assessment of ability to use methods and tools<br>[SU2] Assessment of ability to analyse information  |
|                                 | [K6_K02] is aware of the social role of a technical college graduate, take the reflections on the ethical, scientific and social aspects of the work performed, understands the need to promote, formulating and providing the public with information and opinions concerning the activities of the profession of engineer.   | The student is able to use properly selected methods and enabling devices measurement of basic quantities characterizing processes technological and condition environment. The student has and can apply the knowledge necessary to social understanding, economic, legal and other non-technical business conditions engineering. He can use it acquired knowledge for the purpose modification of existing solutions used in protection environment.  | [SK2] Assessment of progress of work<br>[SK5] Assessment of ability to solve problems that arise in practice<br>[SK4] Assessment of communication skills, including language correctness  |
| Subject contents                | Legal aspects of municipal solid waste management. Legal regulations of waste management in Poland and the EU. Waste classification, definitions. Municipal waste: characteristics, quantity and quality. Municipal waste collection system. Segregation. Recycling. Storage of waste in municipal landfills. Main design and operational requirements for municipal waste landfills. Physical, chemical and biological processes during waste storage. Biogas recovery. Leachate from landfills, characteristics, methods of treatment. Composting of organic waste. Process conditions, compost classification. Composting methods. Thermal methods of waste disposal. Pyrolysis and incineration. Co-combustion with addition of solid fuels. Methane fermentation of organic waste. Process conditions, methods of fermentation. |  |   |
| Prerequisites and co-requisites | Knowledge of terms and definitions in the field of general chemistry and environmental chemistry. Knowledge of chemical technology. Knowledge of health and safety regulations and rules of work in the laboratory.  |  |   |

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|--|--|--|-------------------------------|
| Assessment methods and criteria                                | Subject passing criteria   | Passing threshold  | Percentage of the final grade |
|  | exam   | 60.0%  | 60.0%                         |
|  | laboratory   | 60.0%  | 20.0%                         |
|  | seminar  | 60.0%  | 20.0%                         |
| Recommended reading  | Basic literature   | 1. Bilitewski B., Härdtle G., Marek K.: Podręcznik gospodarki odpadami. Teoria i praktyka. Wydawnictwo "Seidel-Przywecki" Sp. z o.o., Warszawa, 2006.<br><br>2. Żygadło M. (red): Strategia gospodarki odpadami komunalnymi. Polskie Zrzeszenie Inżynierów i Techników Sanitarnych, Poznań, 2001.<br><br>3. Rosik-Dulewska C.: Podstawy gospodarki odpadami. PWN, Warszawa, 2007.<br><br>4. Jędrzak A.: Biologiczne przetwarzanie odpadów. PWN, Warszawa, 2007.<br><br>5. Maciak F.: Ochrona i rekultywacja środowiska. Wydawnictwo SGGW, Warszawa, 2003.<br><br>6. Błędzki A. K. (red): Recykling materiałów polimerowych. WNT, Warszawa, 1997.<br><br>7. Ambrożewicz P., Zwarty system zagospodarowania odpadów, Wydawnictwo Ekonomia i Środowisko, 1999 |                               |
|  | Supplementary literature   | 1.Masters G.M. Introduction to Environmental Engineering and Science, Prentice-Hall inc. London, 1991.<br><br>2.Librizzi W.J., Lowery C.N., Hazardous Waste Treatment, Wat. Poll. Contr. Fed., Virginia 1990.<br><br>3.Janson M. Hazardous waste management engineering, VRN, New York, 1987.<br><br>4.Maughan J., Ecological assessment of hazardous waste sites, VRN, New York, 1993.<br><br>5.Cheremisinoff N.P., Biotechnology for waste and wastewater treatment, Noyes Publikations, 1996.<br><br>6.Martin W.F., Lippitt J.M., Webb P.J. Hazardous Waste Handbook for Health and Safety, Butterworth, Heinemann, 2000.   |                               |
|  | eResources addresses   | Adresy na platformie eNauczanie:<br>2025 Gospodarka odpadami i utylizacja odpadów komunalnych - Moodle ID: 43029<br><a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=43029">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=43029</a>  |                               |
| Example issues/<br>example questions/<br>tasks being completed | List the parameters influencing the efficiency of the composting process. Give the optimal values and describe the importance of these parameters for the process.<br><br>List the ways of controlling emissions from waste incineration. Describe the impact of each of them. |  |                               |
| Work placement   | Not applicable   |  |                               |

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