



Subject card

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| Subject name and code | , PG_00071169 | | | | | | |
| Field of study | Power Engineering | | | | | | |
| Date of commencement of studies | October 2024 | Academic year of realisation of subject | | | 2025/2026 | | |
| Education level | first-cycle studies | Subject group | | | | | |
| Mode of study | Full-time studies | Mode of delivery | | | at the university | | |
| Year of study | 2 | Language of instruction | | | Polish | | |
| Semester of study | 4 | ECTS credits | | | 5.0 | | |
| Learning profile | general academic profile | Assessment form | | | assessment | | |
| Conducting unit | Department of Sanitary Engineering -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Filip Gamoń | | | | | |
| | Teachers | dr inż. Filip Gamoń | | | | | |
| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 0.0 | 0.0 | 0.0 | 60.0 | 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 | | 0.0 | | 0.0 | 60 |
| Subject objectives | <p>The aim of the course is for the student to carry out an independent research project focused on producing green hydrogen through biological dark fermentation using biowaste. The student will prepare and pre-treat biowaste for fermentation using two methods: electrochemical and low-temperature disintegration. The course includes laboratory-scale experimental systems for dark fermentation. The student will take part in designing, constructing, automating, and operating research setups. Another important element of the course is learning to analyze the fermentation process from a physicochemical perspective, including monitoring reaction parameters, interpreting measurement results, and evaluating hydrogen production efficiency. The project develops practical research, engineering, and analytical skills related to modern renewable energy technologies.</p> | | | | | | |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
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| | [K6_W03] knows the basics of automation and automatic regulation, knows the principles of the selection of electrical devices, drive systems and their control | The student is able to select electrical devices, drive systems, and basic control elements with regard to technical and functional requirements. | [SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation |
| | [K6_W05] has structured knowledge in the field of electrical engineering and electronics, necessary to understand the basics of operation and selection of electrical machines, electricity transmission systems and power electronic devices | The student is able to apply knowledge of electrical engineering and electronics to analyze the basic principles of operation and to select electrical machines, electric power transmission systems, and power electronic devices. | [SW3] Assessment of knowledge contained in written work and projects |
| | [K6_W06] knows classic and developmental energy technologies, rules for the selection and operation of heat and energy devices and installations, basic principles of energy systems operation, basic issues regarding the reliability of energy devices and diagnostics, environmental effects of energy technologies used, methods of using renewable energy sources | The student is able to analyze and select energy technologies, thermal and power engineering equipment, and installations, taking into account their operation principles, reliability, diagnostics, environmental impact, and the possibilities of using renewable energy sources. | [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects |
| | [K6_W10] knows the basic installations in the field of renewable energy sources and their impact on the environment | The student is able to distinguish basic renewable energy installations and analyze their impact on the environment. | [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge |
| | [K6_U02] is able to apply the learned mathematical methods to the analysis and design of elements, systems and energy systems | The student is able to apply the acquired mathematical methods to the analysis and design of energy-related components, circuits, and systems. | [SU1] Assessment of task fulfillment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools |
| | [K6_U04] is able to design a simple device structure and prepare the accompanying technical documentation, conduct a basic technical and economic analysis of energy systems, including technologies using renewable and pro-ecological energy sources as well as conventional and nuclear energy, design energy installations for them and their basic elements (including electric lighting)); select, operate and control the most commonly used electrical devices and drive systems. | The student is able to design a simple device and prepare the related technical documentation, carry out a basic technical and economic analysis of energy systems, including technologies using renewable and environmentally friendly energy sources as well as conventional and nuclear energy, and design energy installations and their basic components, including electric lighting. The student is also able to select, operate, and control the most commonly used electrical devices and drive systems. | [SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information |
| Subject contents | <p>Course content – project</p> <p>The course involves the implementation of an individual research project focused on the production of green hydrogen through biological dark fermentation using biowaste. As part of the course, the student becomes familiar with the fundamentals of the dark fermentation process and the importance of biowaste as a substrate in renewable energy technologies. The course content includes the preparation and pre-treatment of biowaste using electrochemical and low-temperature disintegration methods, the design and construction of simple experimental systems, as well as their automation and operation. An important part of the course is conducting laboratory research, monitoring process parameters, performing physicochemical analysis of the fermentation process, interpreting measurement results, and evaluating the efficiency of hydrogen production. As part of the course, the student also develops the ability to plan research work, document results, and formulate conclusions based on the experiments carried out.</p> | | |
| Prerequisites and co-requisites | The student should have a basic understanding of physicochemistry, chemical analysis, automation, and the design of simple experimental systems. The student is also expected to be able to develop and interpret experimental results, independently plan research work, and use scientific literature, including sources in English. | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | Implementation of the project objectives | 51.0% | 100.0% |
| Recommended reading | Basic literature | Ewa Klugmann-Radziemska, <i>Energy and Environmental Protection</i> , PWN Publishing House, 2022. Andrzej Jędrzszak, <i>Biological Waste Treatment</i> , PWN Publishing House, 2007. | |
| | Supplementary literature | brak | |
| | eResources addresses | | |

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| Example issues/ example questions/ tasks being completed | Preparation of biowaste for dark fermentation, selection of pre-treatment methods, design and operation of laboratory setups, monitoring of process parameters, analysis of results, and evaluation of the efficiency of green hydrogen production. |
| Practical activities within the subject | Not applicable |

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