



## Subject card

|                                             |                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                          |                                     |            |                                                                                                                                                                                          |         |     |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| Subject name and code                       | Water and sewage management in the energy sector, PG_00055880                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                          |                                     |            |                                                                                                                                                                                          |         |     |
| Field of study                              | Power Engineering                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                          |                                     |            |                                                                                                                                                                                          |         |     |
| Date of commencement of studies             | October 2024                                                                                                                                                                                                                                                                             | Academic year of realisation of subject                                                                                                                                                                                                                                  |                                     |            | 2024/2025                                                                                                                                                                                |         |     |
| 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                               | 1                                                                                                                                                                                                                                                                                        | Language of instruction                                                                                                                                                                                                                                                  |                                     |            | Polish                                                                                                                                                                                   |         |     |
| Semester of study                           | 2                                                                                                                                                                                                                                                                                        | ECTS credits                                                                                                                                                                                                                                                             |                                     |            | 4.0                                                                                                                                                                                      |         |     |
| Learning profile                            | general academic profile                                                                                                                                                                                                                                                                 | Assessment form                                                                                                                                                                                                                                                          |                                     |            | assessment                                                                                                                                                                               |         |     |
| Conducting unit                             | Department of Environmental Engineering Technology -> Faculty of Civil and Environmental Engineering                                                                                                                                                                                     |                                                                                                                                                                                                                                                                          |                                     |            |                                                                                                                                                                                          |         |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                       | dr hab. inż. Krzysztof Czerwionka                                                                                                                                                                                                                                        |                                     |            |                                                                                                                                                                                          |         |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                 | dr hab. inż. Krzysztof Czerwionka<br>mgr inż. Anna Wilińska-Lisowska<br>dr hab. inż. Rafał Bray<br>dr hab. inż. Eliza Kulbat                                                                                                                                             |                                     |            |                                                                                                                                                                                          |         |     |
| 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                                                                                                                                                                                                                                                                       | 6.0                                 |            | 49.0                                                                                                                                                                                     |         | 100 |
| Subject objectives                          | To acquaint students with models of water and wastewater management and the basic processes of water and wastewater treatment in the energy sector.                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                     |            |                                                                                                                                                                                          |         |     |
| Learning outcomes                           | Course outcome                                                                                                                                                                                                                                                                           | Subject outcome                                                                                                                                                                                                                                                          |                                     |            | Method of verification                                                                                                                                                                   |         |     |
|                                             | [K6_U10] can use correctly selected methods and measuring devices for determination of basic parameters during the water treatment process and wastewater treatment control; can perform basic laboratory tests leading to the assessment of water quality, pollutant load in wastewater | The student is able to choose the methods and measuring devices and perform basic water and sewage quality tests. The student is able to use the obtained results to evaluate the course of water and wastewater treatment processes.                                    |                                     |            | [SU5] Assessment of ability to present the results of task<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU2] Assessment of ability to analyse information |         |     |
|                                             | [K6_W14] has a theoretical knowledge in the field of chemistry, biology, physics and mathematics including knowledge necessary to understand the technological processes related to water treatment, wastewater treatment, waste management in energy facilities, circular economy       | The student has a structured knowledge of the basics of chemistry, biology, physics and mathematics necessary to understand the technological processes related to water treatment, wastewater treatment, waste management in energy facilities, closed-loop management. |                                     |            | [SW2] Assessment of knowledge contained in presentation<br>[SW1] Assessment of factual knowledge                                                                                         |         |     |

| Subject contents                                               | <p>Wykład: Stan aktualny i kierunki transformacji systemu energetycznego Polski w aspekcie gospodarki wodno-ściekowej. Potencjalny wpływ energetyki na środowisko wodne. Modele gospodarki wodno-ściekowej w energetyce. Podstawowe zabiegi i procesy w oczyszczaniu wody (podziemna i powierzchniowa). Stabilność chemiczna i biologiczna wody. Ścieki wytwarzane w elektrowniach węglowych. Oczyszczanie ścieków. BAT w energetyce. Gospodarka wodno-ściekowa w biogazowniach.</p> <p>Laboratorium: Parametry jakości wody (wody powierzchniowe i podziemne); wymagania jakości wody stosowanej w układach chłodzenia oraz do celów kotłowych. Podstawowe zabiegi i procesy w oczyszczaniu wody: dekarbonizacja i koagulacja metodami chemicznymi, wymiana jonowa, filtracja, procesy membranowe.</p> |                   |                               |                          |                   |                               |                 |       |       |                                          |       |       |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------|--------------------------|-------------------|-------------------------------|-----------------|-------|-------|------------------------------------------|-------|-------|
| Prerequisites and co-requisites                                | Basic knowledge of chemistry, biology, physics and mathematics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |                               |                          |                   |                               |                 |       |       |                                          |       |       |
| Assessment methods and criteria                                | <table border="1" data-bbox="451 443 1487 477"> <thead> <tr> <th data-bbox="451 443 794 477">Subject passing criteria</th> <th data-bbox="794 443 1137 477">Passing threshold</th> <th data-bbox="1137 443 1487 477">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 477 794 510">lectures - test</td> <td data-bbox="794 477 1137 510">60.0%</td> <td data-bbox="1137 477 1487 510">60.0%</td> </tr> <tr> <td data-bbox="451 510 794 566">laboratory - class work assessment, test</td> <td data-bbox="794 510 1137 566">60.0%</td> <td data-bbox="1137 510 1487 566">40.0%</td> </tr> </tbody> </table>                                                                                                                                                             |                   |                               | Subject passing criteria | Passing threshold | Percentage of the final grade | lectures - test | 60.0% | 60.0% | laboratory - class work assessment, test | 60.0% | 40.0% |
|                                                                | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Passing threshold | Percentage of the final grade |                          |                   |                               |                 |       |       |                                          |       |       |
|                                                                | lectures - test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 60.0%             | 60.0%                         |                          |                   |                               |                 |       |       |                                          |       |       |
| laboratory - class work assessment, test                       | 60.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 40.0%             |                               |                          |                   |                               |                 |       |       |                                          |       |       |
| lectures - test                                                | 60.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 60.0%             |                               |                          |                   |                               |                 |       |       |                                          |       |       |
| laboratory - class work assessment, test                       | 60.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 40.0%             |                               |                          |                   |                               |                 |       |       |                                          |       |       |
| Recommended reading                                            | <p>Basic literature</p> <p>Bartkiewicz B., Umiejewska K., Oczyszczanie ścieków przemysłowych, PWN, 2022</p> <p>Kowal A.L. Odnowa wody. Podstawy teoretyczne procesów, Wyd. Politechniki Wrocławskiej, 1997</p> <p>Świdarska-Bróż M., Kowal A.L., Oczyszczanie wody, PWN, 2009</p> <p>Bodzek M., Konieczny K., Wykorzystanie procesów membranowych w uzdatnianiu wody, Projprzem-eko, 2005</p>                                                                                                                                                                                                                                                                                                                                                                                                           |                   |                               |                          |                   |                               |                 |       |       |                                          |       |       |
|                                                                | <p>Supplementary literature</p> <p>Szymkiewicz R., Dolna Wisła - rzeka niewykorzystanych możliwości, Wyd. PG, 2018</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                               |                          |                   |                               |                 |       |       |                                          |       |       |
|                                                                | <p>eResources addresses</p> <p>Adresy na platformie eNauczanie:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |                               |                          |                   |                               |                 |       |       |                                          |       |       |
| Example issues/<br>example questions/<br>tasks being completed | <p>Assessment of energy demand for water.</p> <p>Comparison of cooling systems used in Poland; the problem of the discharge of heated water to the receiver.</p> <p>Selection of water treatment methods to achieve boiler water quality.</p> <p>Quality parameters of wastewater generated in conventional coal-fired power plants.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                               |                          |                   |                               |                 |       |       |                                          |       |       |
| Work placement                                                 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                               |                          |                   |                               |                 |       |       |                                          |       |       |