

## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          |                                         |                                     |                                                                          |            |     |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|--------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Monographic lecture – Application of oxidation processes in chemistry, PG_00080864                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          |                                         |                                     |                                                                          |            |     |
| Field of study                              | Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                          |                                         |                                     |                                                                          |            |     |
| Date of commencement of studies             | October 2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                          | Academic year of realisation of subject |                                     | 2026/2027                                                                |            |     |
| Education level                             | Master's studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          | Subject group                           |                                     | Obligatory subject group in the field of study<br>Optional 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                           | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | ECTS credits                            |                                     | 3.0                                                                      |            |     |
| Learning profile                            | academic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          | Assessment form                         |                                     | credit                                                                   |            |     |
| Conducting unit                             | Laboratory of Advanced Oxidation Processes -> Department of General and Inorganic Chemistry -> Faculty of Chemistry -> Rector                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                         |                                     |                                                                          |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | prof. dr hab. Ewa Siedlecka             |                                     |                                                                          |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          |                                         |                                     |                                                                          |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                  | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 30.0                                                     | 0.0                                     | 0.0                                 | 0.0                                                                      | 0.0        | 30  |
|                                             | 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 30                                                       |                                         | 5.0                                 |                                                                          | 40.0       | 75  |
| Subject objectives                          | presentation of the development of physicochemical research in solid and liquid phases over the last century, familiarization with basic instrumental methods used in the characterization of substances tested in scientific works, presentation of the diversity of scientific works carried out under the supervision of KChOI employees, development of skills in independent planning of experimental work and solving problems, preparation for independent selection of scientific literature, leading consequently to the preparation of a master's thesis. |                                                          |                                         |                                     |                                                                          |            |     |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                         |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Learning outcomes               | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Method of verification                                                                  |
|                                 | [CHEMMU2_W01] Uses knowledge of spectroscopic methods of chemical compound analysis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Understands the interpretation of results presented in scientific papers;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | [SW1] oral statement/conversation/discussion<br>[SW2] presentation/project/paper/report |
|                                 | [CHEMMU2_W11] Demonstrates general knowledge about the current trends in the development of chemistry as a science and the latest discoveries in this field.                                                                                                                                                                                                                                                                                                                                                                                                                                                           | maintains the relationships between the topics presented in the lecture and life;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | [SW1] oral statement/conversation/discussion<br>[SW2] presentation/project/paper/report |
|                                 | [CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | can indicate the applied nature of the issues discussed and the critical events (cases) analyzed; discusses the potential usefulness of a business platform using innovative methods using radicals and individual chemical factors of an oxidizing-reducing nature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | [SK1] oral statement/conversation/discussion<br>[SK2] presentation/project/paper/report |
|                                 | [CHEMMU2_W05] Has extended knowledge in the field of the specialisation studied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Can classify radicals and radical reactions; divides AOP methods depending on the generating hydroxyl radicals method; lists the applications of radicals, chemical entities of an oxidation-reduction nature and their reactions in environmental protection, medicine, and chemical synthesis; can list methods commonly used in the analysis and diagnostics of radical reactions; understands the description and course of AOP processes; characterizes and understands the electron transfer process; explains and translates the relationships between the structure of a compound and its oxidation-reduction activity.                                                                                                                                           | [SW1] oral statement/conversation/discussion<br>[SW2] presentation/project/paper/report |
| Subject contents                | Radicals and their types, radical reactions, the role of radical reactions in nature, division of advanced oxidation methods (AOP), methods of generating radicals and other chemical entities with oxidant and reductant characteristics, application of AOP in water treatment, application of AOP in wastewater treatment, application of reduction processes for fuel production, application of radicals in medicine, application of radicals in chemical synthesis, antioxidant activity of natural and synthetic compounds, including complex compounds, factors determining antioxidant activity of compounds. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                         |
| Prerequisites and co-requisites | knowledge of: general, inorganic, analytical and coordination chemistry; knowledge of instrumental methods for characterizing chemical substances; knowledge and ability to use computer programs: Microsoft Office package and Chem Office package.                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                         |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Percentage of the final grade                                                           |
|                                 | activity during classes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 51.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 20.0%                                                                                   |
|                                 | performing tasks assigned by the teacher                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 51.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 80.0%                                                                                   |
| Recommended reading             | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | A. Bielański Podstawy chemii nieorganicznej<br>J. D. Lee Związła chemia nieorganiczna<br>P. Pauling, P. Pauling Chemia<br>G. Griffin Research methods for English studies<br>L. Arnaut, S. Formosino, H. Burrows Chemical kinetics from molecular structure to chemical reactivity<br>R. J. Willson Isothermal microcalorimetry: theoretical development and experimental studies<br>A.2. studiowana samodzielnie przez studenta<br>J. Inczedy Równowagi kompleksowania w chemii analitycznej<br>A. Hulanicki Reakcje kwasów i zasad w chemii analitycznej<br>H. S. Rossotti, F.J.C. Rossotti Równowagi jonowe<br>F. A. Cotton, G. Wilkinson, P.L. Gaus Chemia nieorganiczna.Podstawy<br>A. Bartecki Barwa związków metali<br>A. Frost, R. Pearson Kinetics and mechanism |                                                                                         |
|                                 | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | B. Additional literature<br><br>A. Bartecki Chemia pierwiastków przejściowych<br>S.F.A Kettle Fizyczna chemia nieorganiczna na przykładzie chemii koordynacyjnej<br>J. Polster, H. Lachmann Spectrometric titrations: analysis of chemical equilibria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                         |
|                                 | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                         |

|                                                                |                |
|----------------------------------------------------------------|----------------|
| Example issues/<br>example questions/<br>tasks being completed |                |
| Work placement                                                 | Not applicable |

Document generated electronically. Does not require a seal or signature.