

## Subject card

|                                             |                                                                                                                               |                                                          |                                         |                                     |                                                                                                                                                |            |     |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | MSc laboratory course, PG_00117797                                                                                            |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| 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<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                               | 2                                                                                                                             |                                                          | Language of instruction                 |                                     | English                                                                                                                                        |            |     |
| Semester of study                           | 4                                                                                                                             |                                                          | ECTS credits                            |                                     | 10.0                                                                                                                                           |            |     |
| Learning profile                            | academic                                                                                                                      |                                                          | Assessment form                         |                                     | credit                                                                                                                                         |            |     |
| Conducting unit                             | Faculty of Chemistry -> Rector                                                                                                |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                            |                                                          | dr hab. Joanna Makowska                 |                                     |                                                                                                                                                |            |     |
|                                             | Teachers                                                                                                                      |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Lesson types                                | Lesson type                                                                                                                   | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                                                                                        | Seminar    | SUM |
|                                             | Number of study hours                                                                                                         | 0.0                                                      | 0.0                                     | 190.0                               | 0.0                                                                                                                                            | 0.0        | 190 |
|                                             | 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                                                                                                         | 190                                                      |                                         | 30.0                                |                                                                                                                                                | 30.0       | 250 |
| Subject objectives                          | Planning and performance of experimental research project by each student working under the control / guidance of supervisor. |                                                          |                                         |                                     |                                                                                                                                                |            |     |
|                                             | Presentation of obtained research results in the form of written master thesis                                                |                                                          |                                         |                                     |                                                                                                                                                |            |     |

| Learning outcomes | Course outcome                                                                                                                                             | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                | Method of verification                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|                   | [CHEMMU2_W12] Knows the principles of occupational health and safety to the extent that allows independent work on a research and/or measurement position. | Student understands the need to exercise due caution when using laboratory equipment and working with chemical reagents;<br>- Student knows the applicable regulations and guidelines regarding occupational health and safety in his field. He is aware of how to prevent accidents and knows the appropriate equipment for his workstation                                                                                   | [SW2] presentation/project/paper/report<br>[SW5] implementation of a problem task       |
|                   | [CHEMMU2_W13] Demonstrates knowledge of legal and ethical conditions related to scientific and didactic work.                                              | - Student knows the assumptions of copyright and patent law<br>- Student is aware of the consequences of disregarding intellectual property and the abuse of artificial intelligence tools in scientific, research and teaching work.<br>- Student knows the basic concepts and principles related to the protection of intellectual property.                                                                                 | [SW1] oral statement/conversation/discussion<br>[SW2] presentation/project/paper/report |
|                   | [CHEMMU2_K05] Understands the need for independent search of information in scientific literature and popular science magazines.                           | Student:<br><br>works independently<br>correctly defines priorities necessary for realization of her/his own aims<br>cares for safety during own-self realization of chemical experiments<br><br>takes into account the made arrangements for realization of experiments.                                                                                                                                                      | [SK3] text preparation/written work<br>[SK5] implementation of a problem task           |
|                   | [CHEMMU2_W09] Classifies specialist IT tools used in statistical evaluation of experiment results.                                                         | Student:<br><br>names and describes methods of analysis and/or methods of computer theoretical calculations used during realization of master project<br>distinguishes and characterizes individual experimental/ IT techniques used during realization of research project<br><br>identifies scientific and research apparatuses used during realization of research project and explains the principles of their operations. | [SW4] test/exam - oral or written<br>[SW2] presentation/project/paper/report            |
|                   | [CHEMMU2_W02] Has extended and in-depth knowledge in the field of basic chemistry.                                                                         | Student is able to discuss specialized topics both in Polish and English, correctly arguing his or her conclusions in the field of chemistry at an advanced level in the research topic in which he or she is involved.                                                                                                                                                                                                        | [SW2] presentation/project/paper/report                                                 |
|                   | [CHEMMU2_U10] Reads with understanding scientific and popular science chemical texts in English.                                                           | Student:<br><br>performs scheduled experiments, makes observations<br>analyzes the obtained results and compares them with available literature data<br>draws conclusions from the conducted tests and proves their correctness in based on available literature data<br>presents the same content in a different language convention<br><br>systematically collects and prepares documentation of her/his research work.      | [SU5] implementation of a problem task                                                  |

|                                 | Course outcome                                                                                                                                                                                                                                                                                   | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Method of verification                                                                    |
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|                                 | [CHEMMU2_W10] Uses knowledge of the principles of operation of the basic scientific and research apparatus used in chemistry.                                                                                                                                                                    | Student: names and describes methods of analysis and/or methods of computer theoretical calculations used during realization of master project distinguishes and characterizes individual experimental/ IT techniques used during realization of research project identifies scientific and research apparatuses used during realization of research project and explains the principles of their operations.                                                                                                                                                                                         | [SW1] oral statement/ conversation/discussion<br>[SW5] implementation of a problem task   |
|                                 | [CHEMMU2_U07] Defines and implements the directions of own further education.                                                                                                                                                                                                                    | -Student verifies the level of his knowledge and skills; understands the need for continuous professional education and personal development, demonstrates creativity in working independently and in a team.<br>- Student knows his or her strengths. Knows how to conduct professional exploration in the future. Is able to regularly assess his progress and adapt his actions to new challenges.                                                                                                                                                                                                 | [SU5] implementation of a problem task                                                    |
|                                 | [CHEMMU2_W14] Explains the basic concepts and principles in the field of industrial property and copyright protection and recalls knowledge about the management of intellectual property resources; is able to use patent information.                                                          | -Student is able to explain the basic concepts and principles related to the protection of intellectual property.<br>- Student knows the principles of copyright law, patent law, trademark law, industrial design law, and trade secret law.<br>- Student demonstrates basic knowledge of legal and ethical conditions related to scientific activity, including the protection of intellectual property and copyright;<br>- Student presents extended knowledge of current directions of development and the latest scientific achievements in the field of the subject of his/her master's thesis; | [SW1] oral statement/ conversation/discussion<br>[SW2] presentation/project/paper/ report |
| Subject contents                | The program content is varied and depends on the scope of the topic of the master thesis                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                           |
| Prerequisites and co-requisites | Knowledge of general, inorganic, and organic chemistry, biochemistry, and mathematics at the first-cycle education. Knowledge of basic issues in the field of quantum chemistry, chemometrics and/or related scientific fields. Specific knowledge and skills in programming in Python and/or R. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                           |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                         | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Percentage of the final grade                                                             |
|                                 | Presentation of obtained research results in the form of written master thesis                                                                                                                                                                                                                   | 100.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100.0%                                                                                    |

|                                                                |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| Recommended reading                                            | Basic literature         | <p>Literature required to pass the course</p> <p>A.1. Literature used during classes:</p> <p>Specialist literature in the scope of realized master thesis. The scope of literature is corrected and still adopted to conducted master research topics</p> <p>A.2. Literature for individual studies:</p> <p>Specialist literature in the scope of realized master thesis. The scope of literature is corrected and still adopted to conducted master research topics</p> |
|                                                                | Supplementary literature | <p>Extracurricular readings</p> <p>Specialist literature in the scope of realized master thesis. The scope of literature is corrected and still adopted to conducted master research topics</p>                                                                                                                                                                                                                                                                          |
|                                                                | eResources addresses     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Example issues/<br>example questions/<br>tasks being completed |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Work placement                                                 | Not applicable           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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