

## Subject card

|                                             |                                                                                                                                                                                                                                           |                                                          |                                         |                                     |                                                                                                                                                |            |     |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Synthesis of biologically active compounds, PG_00117756                                                                                                                                                                                   |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Field of study                              | Chemistry                                                                                                                                                                                                                                 |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Date of commencement of studies             | October 2026                                                                                                                                                                                                                              |                                                          | 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                               | 1                                                                                                                                                                                                                                         |                                                          | Language of instruction                 |                                     | Polish                                                                                                                                         |            |     |
| Semester of study                           | 2                                                                                                                                                                                                                                         |                                                          | ECTS credits                            |                                     | 8.0                                                                                                                                            |            |     |
| Learning profile                            | academic                                                                                                                                                                                                                                  |                                                          | Assessment form                         |                                     | credit                                                                                                                                         |            |     |
| Conducting unit                             |                                                                                                                                                                                                                                           |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                        |                                                          | prof. dr hab. Piotr Rekowski            |                                     |                                                                                                                                                |            |     |
|                                             | Teachers                                                                                                                                                                                                                                  |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                               | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                                                                                        | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                     | 0.0                                                      | 0.0                                     | 90.0                                | 0.0                                                                                                                                            | 0.0        | 90  |
|                                             | 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                                                                                                                                                                                                                     | 90                                                       |                                         | 15.0                                |                                                                                                                                                | 95.0       | 200 |
| Subject objectives                          | 1. Chemical synthesis of the tripeptide using the solid-support method (Merrifield method)<br>2. Synthesis of glycoamino acid conjugates<br>3. Synthesis of racemic amino acid derivatives in solution; separation of racemic amino acids |                                                          |                                         |                                     |                                                                                                                                                |            |     |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                         |
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| Learning outcomes               | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                 | Method of verification                  |
|                                 | [CHEMMU2_W04] Applies the acquired knowledge to an in-depth description of the properties of chemical connections, methods of their synthesis and analysis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3. Characterizes methods of peptide bond formation<br>8. Lists ways of forming O- and N-glycosidic bond with amino acids                                                                                                                                                                                                                                                                                        | [SW5] implementation of a problem task  |
|                                 | [CHEMMU2_U02] Critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2. Designs peptide synthesis in a schematic form<br>4. Proposes methods for determining the structure of the sugar part in glycopeptide and glycoamino acid<br>8. Separates the racemic mixture of amino acids                                                                                                                                                                                                  | [SU6] demonstration of practical skills |
|                                 | [CHEMMU2_K04] Correctly identifies and resolves dilemmas related to the profession of a chemist.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3. Demonstrates responsibility in laboratory work (including for work tools entrusted to him, generally available apparatus and laboratory equipment)<br>4. Appreciates the need to continually expand knowledge and practical skills<br>5. Be careful when handling chemicals                                                                                                                                  | [SK5] implementation of a problem task  |
|                                 | [CHEMMU2_W10] Uses knowledge of the principles of operation of the basic scientific and research apparatus used in chemistry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 4. Illustrates the principles of solid-peptide synthesis<br>6. Lists ways to activate the anomeric carbon atom<br>7. Lists the effects of the anomeric effect in mono-, oligo- and polysaccharides                                                                                                                                                                                                              | [SW5] implementation of a problem task  |
|                                 | [CHEMMU2_K02] Is able to undertake a variety of roles in the team, including supervisory ones.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1. Appreciates the need for teamwork skills through discussion and consultation<br>2. Is aware of the need for critical analysis of own work, shows creativity in the search for alternative solutions                                                                                                                                                                                                          | [SK5] implementation of a problem task  |
| Subject contents                | <p><b>Part I.</b> Peptide synthesis: chemical synthesis of tripeptide on solid support with Fmoc / But tactics using trityl resin, chromatographic analysis of tripeptide after synthesis (HPLC), mass spectrum analysis (MS-MALDI-TOF).</p> <p><b>Part II</b> Synthesis of glycoamino acid conjugates: synthesis of 2-acetamido-3,4,6-tri-O-acetyl-2-deoxy--D-glucopyranosyl chloride sugar substrate; sugar derivative coupling reaction with N-9-fluorenylmethoxycarbonyl-L-serine benzyl ester, chromatographic analysis obtained after synthesis of glycoamino acid conjugate (TLC)</p> <p><b>Part III</b> Asymmetric organic synthesis: solution synthesis in racemic amino acid derivatives; separation of racemic amino acids using enzymes (chymotrypsin, papain); separation of racemic amino acids using diastereomeric salts, determination of the degree of optical purity of separated compounds by the polarimetric method</p> |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                         |
| Prerequisites and co-requisites |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                         |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                               | Percentage of the final grade           |
|                                 | a written report on the exercise performed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 51.0%                                                                                                                                                                                                                                                                                                                                                                                                           | 40.0%                                   |
|                                 | - written exam with open questions graded course credit based on individual grades obtained during the semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 51.0%                                                                                                                                                                                                                                                                                                                                                                                                           | 40.0%                                   |
|                                 | activity and involvement in classes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.0%                                                                                                                                                                                                                                                                                                                                                                                                            | 20.0%                                   |
| Recommended reading             | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -Shwan Doonan, Peptydy i białka PWN, Warszawa 2007. -H.-D. Jakubke , H. Jeschkeit, Aminokwasy, peptydy, białka, PWN , Warszawa, 1989. - A. Kołodziejczyk Naturalne związki organiczne, PWN, 2003.Podstawy Chemii Węglowodanów, Świdorski J., Strusiński J., Temeriusz A., 1973. - Podstawy Chemii Cukrów, Wiśniewski A., Madaj, J., 1997. Współczesna synteza organiczna, J. Gawroński, Wydawnictwo naukowe PWN |                                         |
|                                 | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Monographic materials prepared by the lecturers                                                                                                                                                                                                                                                                                                                                                                 |                                         |
|                                 | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                         |

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| Example issues/<br>example questions/<br>tasks being completed | <ol style="list-style-type: none"> <li>1. Chemical synthesis of the tripeptide using the solid-support method (Merrifield method)</li> <li>2. Synthesis of glycoamino acid conjugates</li> <li>3. Synthesis of racemic amino acid derivatives in solution; separation of racemic amino acids</li> </ol> |
| Work placement                                                 | Not applicable                                                                                                                                                                                                                                                                                          |

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