

## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                        |                                                          |                                         |                                     |                        |            |     |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|------------------------|------------|-----|
| Subject name and code                       | Physicochemical methods of peptide analysis, PG_00179577                                                                                                                                                                                                                                                                                                                               |                                                          |                                         |                                     |                        |            |     |
| Field of study                              | Chemical Business, Chemistry                                                                                                                                                                                                                                                                                                                                                           |                                                          |                                         |                                     |                        |            |     |
| Date of commencement of studies             | February 2026                                                                                                                                                                                                                                                                                                                                                                          |                                                          | Academic year of realisation of subject |                                     | 2026/2027              |            |     |
| Education level                             | Master's studies                                                                                                                                                                                                                                                                                                                                                                       |                                                          | Subject group                           |                                     | 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                            |                                     | 1.0                    |            |     |
| Learning profile                            | academic                                                                                                                                                                                                                                                                                                                                                                               |                                                          | Assessment form                         |                                     | credit                 |            |     |
| Conducting unit                             | Faculty of Chemistry -> Rector                                                                                                                                                                                                                                                                                                                                                         |                                                          |                                         |                                     |                        |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                                     |                                                          | dr Agata Gitlin-Domagalska              |                                     |                        |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                               |                                                          |                                         |                                     |                        |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                                            | Lecture                                                  | Tutorial                                | Laboratory                          | Project                | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                  | 12.0                                                     | 0.0                                     | 0.0                                 | 0.0                    | 0.0        | 12  |
|                                             | 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                                                                                                                                                                                                                                                                                                                                                                  | 12                                                       |                                         | 5.0                                 |                        | 8.0        | 25  |
| Subject objectives                          | Providing theoretical knowledge on the structure and physicochemical properties of amino acids and peptides.<br>To familiarize students with instrumental methods used in peptide analysis, such as mass spectrometry and high-performance liquid chromatography (HPLC).<br>To present strategies for peptide identification and sequencing, including enzymatic and chemical methods. |                                                          |                                         |                                     |                        |            |     |

| Learning outcomes | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Subject outcome                                                                                                                                                                                                                                                                                                                                                              | Method of verification                                                                  |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|                   | [BCHMU2_W01] Knows and understands complex physicochemical processes and is able to analyse their course in connection with other fields of science.                                                                                                                                                                                                                                                                                                                                                                                              | Student knows and understands the techniques used for peptide analysis, comprehends the operating principles of the analytical instruments used, and understands the course of analytical procedures. Knows and understands selected characteristic reactions of amino acids and peptides.                                                                                   | [SW2] presentation/project/paper/report                                                 |
|                   | [BCHMU2_U05] Is able to choose and apply, based on the literature of chemical sciences in Polish and English, appropriate methods and tools for solving problems in chemistry and related sciences.                                                                                                                                                                                                                                                                                                                                               | Student is able to search for, analyze, and critically evaluate scientific literature in both Polish and English in order to select appropriate physicochemical methods for peptide analysis and apply them to solving research problems.                                                                                                                                    | [SU1] oral statement/conversation/discussion                                            |
|                   | [BCHMU2_W04] Knows and understands specialist IT tools used in chemical diagnostics.                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Student is able to apply specialized computational tools used in the chemical analysis of peptides (e.g., dedicated software)                                                                                                                                                                                                                                                | [SW2] presentation/project/paper/report                                                 |
|                   | [BCHMU2_K04] Is willing to properly assess the acquired knowledge, respect and disseminate it in order to solve specific cognitive and practical issues.                                                                                                                                                                                                                                                                                                                                                                                          | Student is able to critically evaluate and apply acquired knowledge to perform peptide analysis.                                                                                                                                                                                                                                                                             | [SK1] oral statement/conversation/discussion<br>[SK2] presentation/project/paper/report |
|                   | [BCHMU2_W05] Knows and understands the main trends in the development of chemistry combined with economics as two interpenetrating scientific disciplines.                                                                                                                                                                                                                                                                                                                                                                                        | Student is aware of and understands the importance of developing modern methods for peptide analysis in the context of their industrial, biomedical, and pharmaceutical applications. Is able to identify relations between advances in analytical chemistry and economic aspects such as cost-effectiveness, innovation, and the application of technology in the industry. | [SW2] presentation/project/paper/report<br>[SW3] text preparation/written work          |
|                   | [BCHMU2_U04] Is able to independently plan and perform specific research tasks in the field or in the laboratory, interpret their results working individually or in a team, assuming various roles and functions including managerial.                                                                                                                                                                                                                                                                                                           | Student is able to independently design and conduct experiments related to peptide analysis using physicochemical methods (e.g., HPLC, mass spectrometry, electrophoresis), interpret the obtained results, and collaborate effectively within a team.                                                                                                                       | [SU1] oral statement/conversation/discussion<br>[SU2] presentation/project/paper/report |
|                   | [BCHMU2_K01] Is willing to develop and disseminate appropriate best practices at and outside the workplace.                                                                                                                                                                                                                                                                                                                                                                                                                                       | Student is able to promote the principles of good laboratory practice and ethical research standards in both scientific and professional environments.                                                                                                                                                                                                                       | [SK2] presentation/project/paper/report                                                 |
|                   | [BCHMU2_U01] Is able to, on the basis of her/his knowledge, propose a solution to problems in chemistry, taking into account the economic aspect by using advanced measurement techniques.                                                                                                                                                                                                                                                                                                                                                        | Student is able to select and apply analytical techniques to solve research problems in the field of peptide chemistry analysis, taking into account factors such as cost-effectiveness and equipment availability.                                                                                                                                                          | [SU1] oral statement/conversation/discussion                                            |
| Subject contents  | <p>Introduction to peptide chemistry (structure, classification, physicochemical properties, structural levels)</p> <p>Characteristic reactions of amino acids and peptides</p> <p>Hydrolysis of peptides and proteins (acidic, enzymatic)</p> <p>Techniques for separation and purification of peptides (TLC, HPLC), selection of stationary and mobile phases</p> <p>Mass spectrometry in peptide analysis</p> <p>Peptide sequence identification</p> <p>Interpretation of instrumental data, analysis of HPLC chromatograms and MS spectra</p> |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                         |

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|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Prerequisites and co-requisites | Structure of amino acids, peptides, and proteins. Knowledge in the field of organic chemistry and biochemistry.<br>Basic knowledge of methods used for the analysis of biologically active compounds                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                      |                               |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                                                                    | Passing threshold                                                                                                                                                                                                                                                                                                                                                    | Percentage of the final grade |
|                                 | Final report on the completed laboratory exercises, including an analysis of the obtained results based on the knowledge acquired during the lecture, presented in the form of an oral presentation. The evaluation will focus on the correctness of the formulated conclusions, as well as the analysis and interpretation of the results. | 51.0%                                                                                                                                                                                                                                                                                                                                                                | 100.0%                        |
| Recommended reading             | Basic literature                                                                                                                                                                                                                                                                                                                            | Stryer L., Berg J.M., Tymoczko J.L., Gatto G.J. Biochemia, Wydawnictwo Naukowe PWN, 2018<br><br>Sewald N., Jakubke H.-D. Peptides: Chemistry and Biology, Wiley-VCH, 2009<br><br>Silverstein R.M., Webster F.X., Kiemle D.J. Spektroskopowe metody identyfikacji związków organicznych, Wydawnictwo Naukowe PWN, 2008                                                |                               |
|                                 | Supplementary literature                                                                                                                                                                                                                                                                                                                    | Domagała S. Spektrometria mas w analizie chemicznej i biologicznej, Wydawnictwo Naukowe UAM, 2012.<br><br>Barrett G.C., Elmore D.T. Amino Acids and Peptides, Cambridge University Press, 1998.                                                                                                                                                                      |                               |
|                                 | eResources addresses                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                      |                               |
|                                 | Example issues/<br>example questions/<br>tasks being completed                                                                                                                                                                                                                                                                              | Structure and physicochemical properties of amino acids and peptides;<br>Mechanisms of peptide hydrolysis (acidic, basic, enzymatic);<br>Principles of operation and applications of techniques: HPLC, TLC, mass spectrometry;<br>Interpretation of MS spectra and HPLC chromatograms;<br>Characteristic reactions of functional groups in amino acids and peptides; |                               |
| Work placement                  | Not applicable                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                      |                               |

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