

## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                          |                                         |                                     |                                                                                                                                                |            |     |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Analysis of natural origin products, PG_00073415                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Field of study                              | Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Date of commencement of studies             | October 2026                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                          | Academic year of realisation of subject |                                     | 2027/2028                                                                                                                                      |            |     |
| 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                 |                                     | Polish                                                                                                                                         |            |     |
| Semester of study                           | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          | ECTS credits                            |                                     | 2.0                                                                                                                                            |            |     |
| Learning profile                            | academic                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                          | Assessment form                         |                                     | credit                                                                                                                                         |            |     |
| Conducting unit                             | Faculty of Chemistry -> Rector                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | dr Ewa Mulkiewicz                       |                                     |                                                                                                                                                |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                                                                                                          | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                                                                                        | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.0                                                      | 0.0                                     | 45.0                                | 0.0                                                                                                                                            | 0.0        | 45  |
|                                             | E-learning hours included: 0.0                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                         |                                     |                                                                                                                                                |            |     |
| Learning activity and number of study hours | Learning activity                                                                                                                                                                                                                                                                                                                                                                                                                                    | Participation in didactic classes included in study plan |                                         | Participation in consultation hours |                                                                                                                                                | Self-study | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                                                                                | 45                                                       |                                         | 1.0                                 |                                                                                                                                                | 4.0        | 50  |
| Subject objectives                          | 1. To familiarize students with analytical techniques used to analyze compounds in natural products.<br><br>2. Obtaining the ability to independently perform calculations necessary for the interpretation of the results of analysis.<br><br>3. Obtaining the ability to independently select the appropriate analytical technique for a given purpose.<br><br>4. Obtaining practical skills regarding procedures in a chromatographic laboratory. |                                                          |                                         |                                     |                                                                                                                                                |            |     |

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| Learning outcomes                                              | Course outcome                                                                                                                                                                                                                                                                                                         | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Method of verification                                                   |
|                                                                | [CHEMMU2_U02] Critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors.                                                                                                                                                                                  | Draws conclusions from experimental data. Is able to present the results of quantitative and qualitative analyses. Critically evaluates the results of conducted analyses. Is able to interpret and discuss the obtained analysis results. In discussions regarding analytical and instrumental chemistry professional terminology.                                                                                                                                                                                                                                                                                                            | [SU3] text preparation/written work<br>[SU4] test/exam - oral or written |
|                                                                | [CHEMMU2_U04] Applies acquired knowledge of chemistry and related scientific disciplines.                                                                                                                                                                                                                              | Knows and describes selected techniques and research tools used in the analysis of compounds in natural products. Is able to perform quantitative and qualitative analyses. Is able to independently operate scientific and research equipment.                                                                                                                                                                                                                                                                                                                                                                                                | [SU3] text preparation/written work<br>[SU4] test/exam - oral or written |
|                                                                | [CHEMMU2_W05] Has extended knowledge in the field of the specialisation studied.                                                                                                                                                                                                                                       | Applies acquired knowledge of chemistry to select the appropriate analytical method for a given compound. Is able to plan and perform experiments in the analytical laboratory and analyze and interpret their results.                                                                                                                                                                                                                                                                                                                                                                                                                        | [SW4] test/exam - oral or written<br>[SW3] text preparation/written work |
|                                                                | [CHEMMU2_W10] Uses knowledge of the principles of operation of the basic scientific and research apparatus used in chemistry.                                                                                                                                                                                          | Knows the structure and principles of operation of selected scientific and research equipment used in the analysis of compounds in natural products.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | [SW4] test/exam - oral or written<br>[SW3] text preparation/written work |
|                                                                | [CHEMMU2_W02] Has extended and in-depth knowledge in the field of basic chemistry.                                                                                                                                                                                                                                     | Knows techniques such as gas chromatography, high-performance liquid chromatography, thin-layer chromatography, UV/Vis spectroscopy. Is able to perform quantitative and qualitative analyzes using these techniques.                                                                                                                                                                                                                                                                                                                                                                                                                          | [SW4] test/exam - oral or written<br>[SW3] text preparation/written work |
| Subject contents                                               | Extraction and determination of the content of organic compounds in natural products. Qualitative and quantitative analysis using chromatographic and spectroscopic techniques such as: gas chromatography, high-performance liquid chromatography, thin-layer chromatography, UV/Vis spectroscopy, mass spectrometry. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                          |
| Prerequisites and co-requisites                                | Knowledge of basic issues in general chemistry, organic chemistry, inorganic chemistry and analytical chemistry.                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                          |
| Assessment methods and criteria                                | Subject passing criteria                                                                                                                                                                                                                                                                                               | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Percentage of the final grade                                            |
|                                                                |                                                                                                                                                                                                                                                                                                                        | 51.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 50.0%                                                                    |
|                                                                |                                                                                                                                                                                                                                                                                                                        | 51.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 50.0%                                                                    |
| Recommended reading                                            | Basic literature                                                                                                                                                                                                                                                                                                       | Stepnowski P., Synak E., Szafranek B., Kaczyński Z. Techniki separacyjne. Wydawnictwo UG, 2010.<br>Witkiewicz Z. Podstawy chromatografii, WNT, Warszawa, 2005.<br>Johnstone W. R. A., Rose M. E., Spektrometria mas, PWN, Warszawa, 2001.<br>Grajek W.(red.), Przeciwnutleniacze w żywności. Aspekty zdrowotne, technologiczne, molekularne i analityczne. WNT, Warszawa, 2007.<br>Silverstein R.M., Webster F. X., Kiemle D. J., Spektroskopowe metody identyfikacji związków organicznych, PWN, Warszawa, 2007.                                                                                                                              |                                                                          |
|                                                                | Supplementary literature                                                                                                                                                                                                                                                                                               | Kocjan R. Chemia analityczna. Podręcznik dla studentów. Tom 2. PZWL, Warszawa, 2000.<br>Szczepaniak W. Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 1996.<br>Witkiewicz Z., Hepter J. Chromatografia gazowa, WNT, Warszawa, 2009.<br>Minczewski J., Marczenko Z., Chemia analityczna, tom III, PWN, Warszawa, 1986<br>Kohlmunzer S. Farmakognozja. Wydawnictwo Lekarskie PZWL. Warszawa, 1993.<br>Kączkowski J. Biochemia roślin. Wydawnictwo Naukowe PWN. Warszawa, 1993<br>Sikorski Z. E.(red.), Chemia Żywności, wyd. 4, WNT, Warszawa, 2002.<br>Klepacka M. (red.), Analiza żywności, Fundacja Rozwój SGGW, Warszawa, 2005. |                                                                          |
|                                                                | eResources addresses                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                          |
| Example issues/<br>example questions/<br>tasks being completed |                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                          |

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| Work placement | Not applicable |
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