

## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                      |                                                          |                                         |                                     |                                                                          |            |     |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|--------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Instrumental analysis, PG_00154555                                                                                                                                                                                                                                                                                                                   |                                                          |                                         |                                     |                                                                          |            |     |
| Field of study                              | Medical Biology                                                                                                                                                                                                                                                                                                                                      |                                                          |                                         |                                     |                                                                          |            |     |
| Date of commencement of studies             | October 2024                                                                                                                                                                                                                                                                                                                                         |                                                          | Academic year of realisation of subject |                                     | 2026/2027                                                                |            |     |
| Education level                             | Bachelor's studies                                                                                                                                                                                                                                                                                                                                   |                                                          | Subject group                           |                                     | Obligatory subject group in the field of study<br>Optional subject group |            |     |
| Mode of study                               | full-time studies                                                                                                                                                                                                                                                                                                                                    |                                                          | Mode of delivery                        |                                     | at the university                                                        |            |     |
| Year of study                               | 3                                                                                                                                                                                                                                                                                                                                                    |                                                          | Language of instruction                 |                                     | Polish                                                                   |            |     |
| Semester of study                           | 5                                                                                                                                                                                                                                                                                                                                                    |                                                          | ECTS credits                            |                                     | 3.0                                                                      |            |     |
| Learning profile                            | academic                                                                                                                                                                                                                                                                                                                                             |                                                          | Assessment form                         |                                     |                                                                          |            |     |
| Conducting unit                             | Laboratory of Chemistry and Analytics of Cosmetics -> Department of Analytical Chemistry -> Faculty of Chemistry -> Rector                                                                                                                                                                                                                           |                                                          |                                         |                                     |                                                                          |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                   |                                                          | dr hab. Grzegorz Romanowski             |                                     |                                                                          |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                             |                                                          |                                         |                                     |                                                                          |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                          | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                  | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                | 0.0                                                      | 0.0                                     | 30.0                                | 0.0                                                                      | 0.0        | 30  |
|                                             | E-learning hours included: 0.0                                                                                                                                                                                                                                                                                                                       |                                                          |                                         |                                     |                                                                          |            |     |
| Learning activity and number of study hours | Learning activity                                                                                                                                                                                                                                                                                                                                    | Participation in didactic classes included in study plan |                                         | Participation in consultation hours |                                                                          | Self-study | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                | 30                                                       |                                         | 8.0                                 |                                                                          | 37.0       | 75  |
| Subject objectives                          | Familiarizing a student with the principles of electroanalytical, spectroscopic and chromatographic methods and stages of the analytical process, developing the ability to conduct basic analyses instrumental and their statistical evaluation, developing the ability to solve problems independently problems when conducting chemical analysis. |                                                          |                                         |                                     |                                                                          |            |     |

| Learning outcomes               | Course outcome                                                                                                                                                                                                                                                                                                              | Subject outcome                                                                                                                                                                                         | Method of verification                                                              |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                 | [BIOLMEDL3_W16] explains the theoretical basis of experimental methods and lists the most important techniques of biological sciences that can be applied to medical biology and diagnostics                                                                                                                                | effect achieved during lectures                                                                                                                                                                         | [SW4] test/exam - oral or written                                                   |
|                                 | [BIOLMEDL3_U01] uses basic apparatus and research tools and, maintaining the correct sequence of operations, performs simple physical, biological or chemical observations and measurements in laboratory work in the biological or medical sciences                                                                        | 1. Uses basic formulas to calculate the amount of analyte.<br>2. Performs a measurement according to the instructions for the exercise.<br>3. Knows how to statistically evaluate experimental results. | [SU2] presentation/project/paper/report<br>[SU3] text preparation/written work      |
|                                 | [BIOLMEDL3_K07] Is responsible for the equipment/materials entrusted to him and his own work and respects the work of others                                                                                                                                                                                                | 1. Demonstrates an active attitude when faced with an analytical problem.<br>2. Is able to properly use and maintain the trouble-free operation of the research equipment used.                         | [SK2] presentation/project/paper/report<br>[SK3] text preparation/written work      |
|                                 | [BIOLMEDL3_K06] can think and act in an entrepreneurial manner                                                                                                                                                                                                                                                              | 1. Explains and explains the principles of conducting analyses using various instrumental techniques.<br>2. Recognizes the limitations of using each method.                                            | [SK2] presentation/project/paper/report<br>[SK3] text preparation/written work      |
|                                 | [BIOLMEDL3_K05] jest odpowiedzialny za bezpieczeństwo pracy własnej i innych oraz potrafi rozpoznać sytuacje zagrożenia i podjąć odpowiednie działania                                                                                                                                                                      | 1. Recognizes hazards from used chemical reagents.<br>2. Knows how to take care of the equipment used and the environment (disposal of chemical wastewater).                                            | [SK2] presentation/project/paper/report<br>[SK3] text preparation/written work      |
|                                 | [BIOLMEDL3_U14] is able to prioritize and organize the work of a small team and work effectively as part of a team                                                                                                                                                                                                          | 1. Effectively shares work and communicates effectively within the laboratory group.<br>2. Can collaboratively identify and solve problems and analyze results.                                         | [SU2] presentation/project/paper/report<br>[SU3] text preparation/written work      |
|                                 | [BIOLMEDL3_U12] has the ability to present his own ideas and adequate argumentation in the context of selected theoretical and practical perspectives of medical biology                                                                                                                                                    | effect achieved during auditorium exercises                                                                                                                                                             | [SU1] oral statement/conversation/discussion<br>[SU3] text preparation/written work |
|                                 | [BIOLMEDL3_U04] applies basic statistical methods and computer algorithms and techniques to describe phenomena and data analysis                                                                                                                                                                                            | effect achieved during auditorium exercises                                                                                                                                                             | [SU1] oral statement/conversation/discussion<br>[SU3] text preparation/written work |
|                                 | [BIOLMEDL3_U02] is able to use basic equipment and apparatus used in diagnostics or neuroscience                                                                                                                                                                                                                            | 1. Describes the construction of equipment used in instrumental methods and knows what analytical task it can be used for.<br>2. Knows the principles of its operation and knows how to operate it.     | [SU2] presentation/project/paper/report<br>[SU3] text preparation/written work      |
| Subject contents                | Basics of laboratory work with equipment, performing chemical determinations and analyzes related to spectroscopic methods (UV-Vis spectroscopy), chromatographic methods (gas chromatography) and electroanalytical methods (potentiometry, conductometry, coulometry, polarography, voltammetry, amperometric titration). |                                                                                                                                                                                                         |                                                                                     |
| Prerequisites and co-requisites | knowledge of chemical methods of qualitative and quantitative analysis                                                                                                                                                                                                                                                      |                                                                                                                                                                                                         |                                                                                     |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                                                    | Passing threshold                                                                                                                                                                                       | Percentage of the final grade                                                       |
|                                 | report                                                                                                                                                                                                                                                                                                                      | 51.0%                                                                                                                                                                                                   | 35.0%                                                                               |
|                                 | test                                                                                                                                                                                                                                                                                                                        | 51.0%                                                                                                                                                                                                   | 65.0%                                                                               |

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| Recommended reading                                            | Basic literature         | <p>W. Szczepaniak, Metody instrumentalne w analizie chemicznej, PWN, Warszawa</p> <p>A. Cygański, Metody spektroskopowe w chemii analitycznej, WNT, Warszawa</p> <p>A. Cygański, Metody elektroanalityczne, WNT, Warszawa</p> <p>A.2. studiowana samodzielnie przez studenta</p> <p>G.W. Ewing, Metody instrumentalne w analizie chemicznej, PWN, Warszawa</p> <p>J. Minczewski, Z. Marczenko, Chemia analityczna t. III Analiza instrumentalna, PWN, Warszawa</p> |
|                                                                | Supplementary literature | <p>D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Podstawy chemii analitycznej, PWN, Warszawa</p> <p>J. Garaj, Fizyczne i fizykochemiczne metody analizy, WNT, Warszawa</p>                                                                                                                                                                                                                                                                                      |
|                                                                | eResources addresses     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Example issues/<br>example questions/<br>tasks being completed |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Work placement                                                 | Not applicable           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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