

## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                                             |                                     |                                                                                                                                                                                                                                                                  |            |     |
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| Subject name and code                       | Next-generation biotechnology in medicine and forensic investigations, PG_00211841                                                                                                                                                                                                                                                                                                                |                                                          |                                             |                                     |                                                                                                                                                                                                                                                                  |            |     |
| Field of study                              | Forensic Analytics                                                                                                                                                                                                                                                                                                                                                                                |                                                          |                                             |                                     |                                                                                                                                                                                                                                                                  |            |     |
| Date of commencement of studies             | October 2026                                                                                                                                                                                                                                                                                                                                                                                      |                                                          | Academic year of realisation of subject     |                                     | 2028/2029                                                                                                                                                                                                                                                        |            |     |
| 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<br>During the course, selected content is also presented in English in the form of excerpts from lectures and educational videos, allowing students to become familiar with specialist terminology used in biotechnology, medicine, and forensic science. |            |     |
| Semester of study                           | 6                                                                                                                                                                                                                                                                                                                                                                                                 |                                                          | 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 hab. Agnieszka Żylicz-Stachula, prof. UG |                                     |                                                                                                                                                                                                                                                                  |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                          |                                                          |                                             |                                     |                                                                                                                                                                                                                                                                  |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                                                       | Lecture                                                  | Tutorial                                    | Laboratory                          | Project                                                                                                                                                                                                                                                          | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                             | 30.0                                                     | 0.0                                         | 0.0                                 | 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                                                       |                                             | 5.0                                 |                                                                                                                                                                                                                                                                  | 15.0       | 50  |
| Subject objectives                          | The aim of the course is to provide students with knowledge of modern biotechnological technologies and their applications in medicine and criminal investigations. The course also aims to develop students' ability to critically evaluate the potential and limitations of modern biotechnological technologies and to understand the ethical, legal, and social aspects of their application. |                                                          |                                             |                                     |                                                                                                                                                                                                                                                                  |            |     |

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|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Learning outcomes                                              | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Subject outcome                                                                                                                                                                                                                                                                                                                                                                      | Method of verification                                                                                  |
|                                                                | [AKRL3_W12] The graduate knows and understands, at an advanced level, the latest trends and achievements in analytical chemistry, toxicology, molecular biology and instrumental methods used in forensic science.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The student knows examples of the applications of recombinant nucleic acids, biomaterials, and proteins in medical biotechnology. The student knows and understands the relationship between biotechnology and forensic science. The student recognizes the important role and broad range of applications of modern biotechnology in medicine and forensic science.                 | [SW4] test/exam - oral or written                                                                       |
|                                                                | [AKRL3_K04] The graduate is ready to cooperate with representatives of other fields—law, medicine, biology—within forensic expertise.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | The student is prepared to collaborate with representatives of different disciplines in the application of biotechnological methods in medicine and forensic investigations.                                                                                                                                                                                                         | [SK1] oral statement/conversation/discussion<br>[SK8] observation of student's independent or team work |
|                                                                | [AKRL3_U08] The graduate is able to prepare oral and written presentations and reports in Polish and in chosen foreign language, as well as present and evaluate different viewpoints and engage in discussion in those languages.                                                                                                                                                                                                                                                                                                                                                                                                                                      | The student is able to prepare and deliver an oral or written presentation on the selected applications of modern biotechnological technologies in medicine or criminal investigations, and to critically analyze and discuss different perspectives on their use.                                                                                                                   | [SU1] oral statement/conversation/discussion<br>[SU2] presentation/project/paper/report                 |
| Subject contents                                               | Introduction to next-generation biotechnology and its applications in medicine and forensic science. Genomics, transcriptomics, proteomics, and next-generation sequencing (NGS) technologies. Precision medicine and pharmacogenomics. Gene and cell therapies, genome editing, and recombinant biotechnological products. Examples of the application of biotechnology in criminal investigations, including human identification using genetic markers, DNA phenotyping, metagenomics, and microbiome analysis. Ethical, legal, and social aspects of the application of modern biotechnological technologies, as well as future perspectives for their development. |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                         |
| Prerequisites and co-requisites                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                         |
| Assessment methods and criteria                                | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Passing threshold                                                                                                                                                                                                                                                                                                                                                                    | Percentage of the final grade                                                                           |
|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.0%                                                                                                                                                                                                                                                                                                                                                                                 | 20.0%                                                                                                   |
|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.0%                                                                                                                                                                                                                                                                                                                                                                                 | 30.0%                                                                                                   |
|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.0%                                                                                                                                                                                                                                                                                                                                                                                 | 50.0%                                                                                                   |
| Recommended reading                                            | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Brown, T.A. Genomy . Wydawnictwo Naukowe PWN, 2025<br>Bal, J. Genetyka medyczna i molekularna. Wydawnictwo Naukowe PWN, wyd. V, Warszawa, 2023<br>Kristiansen, B., Ratledge, C. Podstawy biotechnologii. Wydawnictwo Naukowe PWN, wyd. 1, 2011, Warszawa, 2024<br>Buckingham, M.L.; Molecular diagnostics: Fundamentals, Methods and Clinical Applications. F.A. Davis Company, 2019 |                                                                                                         |
|                                                                | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Selected scientific publications and review articles in Polish and English (updated annually and available online), provided by the course instructor during the semester in which the course is delivered.                                                                                                                                                                          |                                                                                                         |
|                                                                | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                         |
| Example issues/<br>example questions/<br>tasks being completed | Stem cells capable of giving rise to all embryonic and extraembryonic tissue types are called:<br>a) multipotent<br>b) pluripotent<br>c) totipotent<br>d) unipotent<br>Complete the following sentence.<br>Genetically determined variants of the TPMT enzyme influence the bioavailability and toxicity of _____.                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                         |
| Work placement                                                 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                         |

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