



## Subject card

|                                             |                                                                                                                                                                                                                        |                                                          |                                         |                                     |                                                                                                                         |            |     |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | MOLECULAR IMMUNOLOGY, PG_00063820                                                                                                                                                                                      |                                                          |                                         |                                     |                                                                                                                         |            |     |
| Field of study                              | Biotechnology                                                                                                                                                                                                          |                                                          |                                         |                                     |                                                                                                                         |            |     |
| Date of commencement of studies             | October 2025                                                                                                                                                                                                           |                                                          | Academic year of realisation of subject |                                     | 2026/2027                                                                                                               |            |     |
| Education level                             | second-cycle studies                                                                                                                                                                                                   |                                                          | Subject group                           |                                     | Optional subject group<br>Specialty 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<br>-                                                                                                             |            |     |
| Semester of study                           | 3                                                                                                                                                                                                                      |                                                          | ECTS credits                            |                                     | 3.0                                                                                                                     |            |     |
| Learning profile                            | general academic profile                                                                                                                                                                                               |                                                          | Assessment form                         |                                     | assessment                                                                                                              |            |     |
| Conducting unit                             | Department of Biotechnology and Microbiology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology                                                                                                   |                                                          |                                         |                                     |                                                                                                                         |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                     |                                                          | dr hab. inż. Lucyna Holec-Gąsior        |                                     |                                                                                                                         |            |     |
|                                             | Teachers                                                                                                                                                                                                               |                                                          | dr hab. inż. Lucyna Holec-Gąsior        |                                     |                                                                                                                         |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                            | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                                                                 | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                  | 15.0                                                     | 0.0                                     | 30.0                                | 0.0                                                                                                                     | 0.0        | 45  |
|                                             | E-learning hours included: 0.0                                                                                                                                                                                         |                                                          |                                         |                                     |                                                                                                                         |            |     |
|                                             | eNauczanie source addresses:<br>Moodle ID: 6944 IMMUNOLOGIA MOLEKULARNA 2026/2027<br><a href="https://enauczanie.pg.edu.pl/2025/course/view.php?id=6944">https://enauczanie.pg.edu.pl/2025/course/view.php?id=6944</a> |                                                          |                                         |                                     |                                                                                                                         |            |     |
| 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                                                       |                                         | 3.0                                 |                                                                                                                         | 27.0       | 75  |
| Subject objectives                          | The course aims to provide knowledge in molecular immunology, discuss the molecular basis of immune processes, and familiarize students with laboratory techniques utilizing antigen-antibody reactions.               |                                                          |                                         |                                     |                                                                                                                         |            |     |

| Learning outcomes               | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Method of verification                                                                                                                                                   |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | [K7_W01] defines the phenomena, processes and laws of living nature applied to the production of useful goods and the carrying out of services                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | knows and understands the phenomena, processes, and principles of molecular biology underlying the functioning of the immune system, including the genetic organization and regulation of B and T lymphocyte activity, the mechanisms of antibody diversity and production, and the role of cytokines; the student also possesses knowledge regarding the principles of operation and classification of modern immunodiagnostic techniques (ELISA, Western blotting, chemiluminescent assays) used in diagnostics and scientific research | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects                                                            |
|                                 | [K7_K01] understands the need to constantly update knowledge based on the state of the art in accordance with the latest scientific literature, improve professional skills and the importance of teamwork                                                                                                                                                                                                                                                                                                                                                                                                               | is prepared to effectively collaborate and fulfill various roles within a research team, continuously update their knowledge in molecular immunology based on the latest literature and advancements in diagnostic methods, and make responsible decisions while adhering to ethical principles in scientific and diagnostic work.                                                                                                                                                                                                        | [SK1] Assessment of group work skills<br>[SK3] Assessment of ability to organize work<br>[SK5] Assessment of ability to solve problems that arise in practice            |
|                                 | [K7_U05] proposes solutions to technological and scientific problems in biotechnology and related fields using experimental methods and bioinformatics, statistics and specialized databases                                                                                                                                                                                                                                                                                                                                                                                                                             | is able to propose and select appropriate experimental solutions as well as bioinformatic and diagnostic tools to solve scientific and applied problems in molecular immunology, using specialized databases and modern techniques for analyzing the immune response (such as ELISA, Western blotting, dot blot, or chemiluminescent assays).                                                                                                                                                                                             | [SU5] Assessment of ability to present the results of task<br>[SU2] Assessment of ability to analyse information<br>[SU4] Assessment of ability to use methods and tools |
| Subject contents                | <p>Course content – lecture</p> <p>B lymphocytes: control of gene expression in differentiation. Antibody diversity generation (immunoglobulin gene organization, recombination, and transcription regulation). Regulation of immunoglobulin production (immune response maturation and isotype switching). T lymphocytes: TCR gene organization and recombination, and thymic education mechanisms. Major histocompatibility complex (MHC) and other blood cell antigen systems. Immunohematology. Protein immunodetection techniques (ELISA, dot blot, Western blotting).</p>                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                          |
|                                 | <p>Course content – laboratory</p> <p>Discussion of Health and Safety regulations and introduction to basic immunodiagnostic techniques. Immunoidentification of a fusion protein using the dot blot method. Western blotting test using monoclonal antibodies. Western blotting test using polyclonal rabbit serum. Direct ELISA – titration of antigen and antibody amounts. Indirect ELISA – detection of specific anti-Toxoplasma antibodies in animal sera. Chemiluminescent enzyme immunoassay (CLIA) – principles of operation, detection of specific antibodies and antigens, and interpretation of results.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                          |
| Prerequisites and co-requisites | Knowledge of immunology and molecular biology.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                          |
| Assessment methods and criteria | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Percentage of the final grade                                                                                                                                            |
|                                 | lecture – final test upon completion of the lecture series                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 60.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 60.0%                                                                                                                                                                    |
|                                 | laboratory – laboratory class report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 60.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 20.0%                                                                                                                                                                    |
|                                 | laboratory – written test covering material from laboratory classes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 60.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 20.0%                                                                                                                                                                    |
| Recommended reading             | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ol style="list-style-type: none"> <li>1. Scientific publications related to the lecture topics.</li> <li>2. Roitt I., Brostoff J., Male D. Immunology, Medical Publisher PZWL.</li> <li>3. Gołab J., Jakóbsiak M., Lasek W., Stokłosa T. Immunology, PWN.</li> <li>4. Węgleński P. Molecular genetics, PWN.</li> <li>5. Drewa G., Ferenc T. Medical genetics. Handbook for Students, Elsevier.</li> </ol>                                                                                                                                |                                                                                                                                                                          |
|                                 | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                          |
|                                 | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                          |

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| Example issues/<br>example questions/<br>tasks being completed | <ul style="list-style-type: none"> <li>• Methods for the immunodetection of proteins.</li> <li>• Control of the expression of genes involved in B cell differentiation.</li> <li>• Formation of antibodies variability and regulation of immunoglobulin production.</li> <li>• Organization and recombination of TCR receptor genes.</li> <li>• Major histocompatibility complex and other systems of blood cells antigens.</li> </ul> |
| Practical activities within<br>the subject                     | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                         |

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