University of Gdańsk

Subject card

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|---|---|---|---|
| Subject name and code | Development and differentiation of the cells and organisms, PG_00207353 | | |
| Field of study | Biology | | |
| Date of commencement of studies | October 2026 | Academic year of realisation of subject | 2026/2027 |
| 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 | 1 | Language of instruction | Polish |
| Semester of study | 2 | ECTS credits | 2.0 |
| Learning profile | academic | Assessment form | credit |
| Conducting unit | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Joanna Rojek | |
| | Teachers | | |

| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 0.0 | 30.0 | 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 | 4.0 | 16.0 | 50 |

| Subject objectives | |
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| | - Gain knowledge of the molecular and cellular mechanisms of reproduction and development of plant organisms,- Knowledge of the processes leading to the proper development and differentiation of plant and animal cells and tissues,- The ability to correlate knowledge of the regulation of developmental processes at the molecular [(epi-) genetic] and cellular levels. |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [BIOLMU2_W04] has in-depth knowledge of the chosen specialization in the biological sciences | The graduate has an in-depth knowledge of the development and differentiation of cells and plant and animal organisms B2_W04 | [SW4] test/exam - oral or written |
| [BIOLMU2_W01] has a deep knowledge and understanding of natural phenomena and processes at various levels of complexity | The graduate understands the phenomena and processes of development and differentiation of cells and organisms at different levels of complexity B2_W01 | [SW4] test/exam - oral or written |
| [BIOLMU2_U07] is able to critically compare biological information from various sources and draw justified conclusions on this basis | The graduate critically confronts biological information from various sources and builds justified conclusions on this basis. | [SU4] test/exam - oral or written |
| [BIOLMU2_U02] is able to proficiently use the scientific literature of the biological speciality studied | The graduate is proficient in the use of scientific literature on the development and differentiation of cells and organisms B2_U0 | [SU4] test/exam - oral or written |
| [BIOLMU2_K05] is ready to use recognized sources of scientific and popular information in the field of biological sciences in order to deepen his/her knowledge | The graduate understands the need to use recognized sources of scientific and popular science information in the field of biological sciences in order to deepen knowledge. | [SK4] test/exam - oral or written |

## Subject contents

Plant part: Molecular and cellular mechanisms of formation and differentiation of main meristems, lateral meristems and plant tissues.Molecular mechanisms of formation and differentiation of gametophytes, gametes, zygote. Genetic regulation of embryogenesis and seed development.The use of mutants and transgenic plants to explain the regulation of processes in plant development.

Animal part: Basic mechanisms of reproduction of animal organisms. Molecular and cellular mechanisms of oogenesis; spermatogenesis and the process of fertilization; Genetic regulation of early embryonic development of Drosophila melanogaster; homeotic genes, homeoboxes and homeodomains; geneticregulation of Caenorhabditis elegans development; regulation of the formation of various tissues and organs; development of the vertebrate nervous system; geneticbasis of tumorigenesis and developmental disorders.Selected examples of induction of animal cell differentiation in vitro, molecular markers of tissues and cell lines.

## Prerequisites and co-requisites

Passing the compulsory subjects of the bachelor's degree

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Class participation, written test | 51.0% | 100.0% |

## Recommended reading

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| Basic literature | The lecture is an original study of the issues of molecular biology of development and differentiation of plant and animal cells based onmany years of study of source literature and own research.Recommended literature:Literature - primarily in the form of published review and experimental papers - will be suggested on an ongoing basis.- Scott F. Gilbert 2014, Developmental Biology, 10th Edition, Sinauer Associates , Inc., Sunderland, MA- Lodish H., Berk A, Kaiser C., Krieger M., Scott M, Bretscher A, 2007. Molecular Cell Biology. Scientific American Books, Washington, DC.- Krzanowska H, Sokół-Misiak W, 2002, Molekularne mechanizmy rozwoju zarodkowego. Wydawnictwo Naukowe PWN, Warszawa- Bielańska-Osuchowska Z, 2004, Zarys organogenezy. Wydawnictwo Naukowe PWN, Warszawa |
| Supplementary literature | Rojek J, Tucker MR, Rychłowski M, Nowakowska J, Gutkowska M. 2021. The Rab Geranylgeranyl Transferase Beta Subunit Is Essential for Embryoand Seed Development in Arabidopsis thaliana. International Journal of Molecular Sciences. 22(15):7907. https://doi.org/10.3390/ijms22157907Rojek J, Tucker MR, Pinto SC, Rychłowski M, Lichocka M, Soukupova H, Nowakowska J, Bohdanowicz J, Surmacz G, Gutkowska M. 2021. Rabdependentvesicular traffic affects female gametophyte development in Arabidopsis. Journal of Experimental Botany. 72(2):320-340. doi:10.1093/jxb/eraa430Rajewsky N, Jurga S, Barciszewski J . 2017. Plant Epigenetics. Springer |
| eResources addresses | |

## Example issues/ example questions/ tasks being completed

The written test covers the lecture material in the form of closed questions.

## Work placement

Not applicable

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