

## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          |                                         |                                     |                   |            |     |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|-------------------|------------|-----|
| Subject name and code                       | Development and differentiation of cells and organisms, PG_00090773                                                                                                                                                                                                                                                                                                                                                                                 |                                                          |                                         |                                     |                   |            |     |
| Field of study                              | Genetics and Experimental Biology                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                                         |                                     |                   |            |     |
| Date of commencement of studies             | October 2023                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                          | Academic year of realisation of subject |                                     | 2025/2026         |            |     |
| Education level                             | Bachelor's studies                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | 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                           | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | ECTS credits                            |                                     | 2.0               |            |     |
| Learning profile                            | academic                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          | Assessment form                         |                                     | credit            |            |     |
| Conducting unit                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          |                                         |                                     |                   |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | dr Anna Kloska                          |                                     |                   |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          | dr Anna Kloska<br><br>dr Joanna Rojek   |                                     |                   |            |     |
| 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                                                       |                                         | 0.0                                 |                   | 0.0        | 30  |
| Subject objectives                          | <ul style="list-style-type: none"><li>- Gaining knowledge of the molecular and cellular mechanisms of reproduction and development of plant organisms,</li><li>- Knowledge of the processes leading to the proper development and differentiation of plant and animal cells and tissues,</li><li>- Ability to correlate information about the regulation of developmental processes at the molecular [(epi-)genetic] and cellular levels.</li></ul> |                                                          |                                         |                                     |                   |            |     |

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| Learning outcomes                                        | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Method of verification            |
|                                                          | [GBEL3_U04] The graduate is able to: read scientific texts in English and Polish with comprehension, synthesise the knowledge they contain, prepare well-documented papers on biological problems and on the commercialisation of research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | The graduate is able to read and understand scientific texts in English and Polish in the field of developmental biology, synthesize the knowledge contained therein, and prepare well-documented studies of biological problems, in particular those related to the development and differentiation of plant and animal cells and organisms (GM1_U04)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | [SU4] test/exam - oral or written |
|                                                          | [GBEL3_W06] A graduate has an advanced knowledge and understanding of: the development and current state of knowledge and the latest trends in molecular genetics and related fields; indicates their relationship to other disciplines in the life sciences or medical sciences and their potential for use in practice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The graduate is familiar with the development and current state of knowledge concerning the development and differentiation of cells and organisms, as well as the latest trends in molecular genetics; indicates their relationship with other disciplines of natural or medical sciences and the possibilities of their practical application (GM1_W06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | [SW4] test/exam - oral or written |
|                                                          | [GBEL3_K07] The graduate is prepared to: lifelong learning and updating of knowledge in molecular genetics and other fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | The graduate understands the need for lifelong learning and updating knowledge in the field of developmental biology (GM1_K07).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | [SK4] test/exam - oral or written |
| Subject contents                                         | Plant Part: Molecular and cellular mechanisms of the formation and differentiation of embryonic, primary, and lateral meristems and plant tissues. Molecular and cellular mechanisms of the formation and differentiation of gametophytes, gametes, embryo, and endosperm. Genetic regulation of embryogenesis and seed development. Application of mutants and transgenic plants to elucidate the regulation of plant developmental processes. Animal Part: Basic mechanisms of reproduction in animal organisms. Molecular and cellular mechanisms of oogenesis; spermatogenesis and fertilization; Genetic regulation of early embryonic development in <i>Drosophila melanogaster</i> ; homeotic genes, homeoboxes, and homeodomains; genetic regulation of <i>Caenorhabditis elegans</i> development; regulation of the formation of various tissues and organs; development of the vertebrate nervous system; genetic basis of neoplasia and developmental disorders. Selected examples of inducing animal cell differentiation in vitro, molecular markers for tissues and cell lines. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |
| Prerequisites and co-requisites                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |
| Assessment methods and criteria                          | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Percentage of the final grade     |
|                                                          | attendance at lectures + test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 51.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 100.0%                            |
| Recommended reading                                      | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | The lecture is an original study of molecular biology of plant and animal cell development and differentiation, based on many years of study of source literature and our own research. Recommended reading: Literature - primarily in the form of published review and experimental works - 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, Molecular mechanisms of embryonic development. PWN Scientific Publishing House, Warsaw - Bielańska-Osuchowska Z., 2004, Outline of Organogenesis. PWN Scientific Publishing House, Warsaw                                                                    |                                   |
|                                                          | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Rojek J, Tucker MR, Rychłowski M, Nowakowska J, Gutkowska M. 2021. The Rab Geranylgeranyl Transferase Beta Subunit Is Essential for Embryo and Seed Development in <i>Arabidopsis thaliana</i> . International Journal of Molecular Sciences. 22(15):7907. <a href="https://doi.org/10.3390/ijms22157907">https://doi.org/10.3390/ijms22157907</a> Rojek J, Tucker MR, Pinto SC, Rychłowski M, Lichocka M, Soukupova H, Nowakowska J, Bohdanowicz J, Surmacz G, Gutkowska M. 2021. Rabdependent vesicular traffic affects female gametophyte development in <i>Arabidopsis</i> . Journal of Experimental Botany. 72(2):320-340. doi:10.1093/jxb/eraa430Paro R, Grossniklaus U, Santoro R, Wutz A. 2021. Introduction to epigenetics. Learning materials in biosciences. Cham, Switzerland: Springer, 179201.Rajewsky N, Jurga S, Barciszewski J . 2017. Plant Epigenetics. Springer |                                   |
|                                                          | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |
| Example issues/ example questions/ tasks being completed | The written test covers lecture material in the form of closed questions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |
| Work placement                                           | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |

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