UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU

Developmental biology

Educational subject description sheet

Basic information

Study programme Biotechnology	**Didactic cycle** 2024/25
Speciality -	**Subject code** 01BTES.21N.15694.24
Organizational unit Faculty of Biology	**Lecture languages** English
Study level Second-cycle programme	**Course type** Obligatory
Study form Full-time	**Block** Subjects not assigned
Education profile General academic	

Subject coordinator	Michał Gdula
Lecturer	Michał Gdula, Kinga Kamieniarz-Gdula, Małgorzata Borowiak, Jadwiga Jaruzelska

Period	**Activities and hours**	**Number of ECTS points**
Semester 1	• Lecture: 20, Graded credit • Laboratories: 22, Graded credit	4

Goals

Code	Goal
C1	The overall aim of this course to provide students with solid basic knowledge of developmental biology and practical skills related to studying developmental processes occurring in animals.
C2	The second major aim is providing solid grounds for understanding of human development and human genetic diseases, which can only be achieved by studying different model organisms and various experimental methodologies (working with whole organisms and tissues, microcopy and genomic-based approaches).
C3	Specifically, the lectures cover the following topics: - variability of sex determination in animals, human sex determination including abnormalities of that process and their medical impact. - specification and development of the germ cells: from pre-formation by the presence of the germ plasm in the model organisms such as Xenopus, Danio, Drosophila and Caenorhabiditis, up to animals such as mouse, pig and humans specifying germ cells by induction from peri-implantation cell precursors - molecular mechanisms of the body patterning from Drosophila based on morphogenetic gradients up to mammals - epigenetics, parental imprinting and human diseases originating from disturbed imprinting - mechanisms of X-inactivation and pathologies due to abnormal X-inactivation - posttranscriptional control in development including body patterning, germ cell development and sex determination - mechanisms of ageing
C4	Specifically, the practical classes allow the students to: -Follow animal development using microscopy methods (laboratory) -Study organ and tissue development on the example of the epidermis and hair follicle (laboratory) -View and interpret real genomic data regarding transcriptional and epigenetic regulation of development (computational class)

Subject learning outcomes

Code	Outcomes in terms of	Learning outcomes	Examination methods
Knowledge – Student:			
W1	understands basic processes of animal development.	BTY_K2_W02, BTY_K2_W03, BTY_K2_W04	Written colloquium, Oral colloquium
W2	perceives close connections between developmental processes - both in health and in human disease.	BTY_K2_W02, BTY_K2_W03, BTY_K2_W04	Oral colloquium, Oral statement
W3	knows and recognizes the importance of animal models used to study developmental processes and how they can be ethicly employed for medical biotechnology.	BTY_K2_W02, BTY_K2_W03, BTY_K2_W04, BTY_K2_W08	Oral colloquium, Oral statement
W4	understands and correctly applies specific terms used in developmental biology.	BTY_K2_W09	Written colloquium, Oral colloquium
Skills – Student:			
U1	studies those processes in more details based on the proposed literature.	BTY_K2_U03, BTY_K2_U07	Oral colloquium, Report, Multimedia presentation, Oral statement
U2	is able to study developmental processes using microscopy, computationally analyze published microscopy data, and present and discuss own findings with peers.	BTY_K2_U01, BTY_K2_U03, BTY_K2_U05, BTY_K2_U06	Report, Multimedia presentation, Oral statement
U3	can use a genomic browser to access, browse and interpret epigenetic developmental biology data.	BTY_K2_U01, BTY_K2_U03	Report, Oral statement
Social competences – Student:			

Code	Outcomes in terms of	Learning outcomes	Examination methods
K1	recognizes the importance of the research in developmental biology for medicine.	BTY_K2_K01	Oral colloquium, Oral statement
K2	is able to hold scientific discussion on topics related to developmental biology.	BTY_K2_K01, BTY_K2_K02, BTY_K2_K03	Oral colloquium, Oral statement
K3	appreciates developmental processes viewed at the level of whole organisms, organs/tissues and single cells, is able to consolidate them.	BTY_K2_K01, BTY_K2_K02, BTY_K2_K03, BTY_K2_K05	Oral colloquium, Oral statement

Study content

No.	Course content	Subject learning outcomes	Activities
1.	Animal and human sex determination including human pathologies of that process.	W1, W2, W3, W4, K1	Lecture
2.	Specification and development of germ cell line in lower organisms and mammals.	W1, W2, W3, W4, U3	Lecture, Laboratories
3.	Molecular processes of early stages of the body patterning in lower organisms and mammals.	W1, W2, W3, W4, U2	Lecture, Laboratories
4.	Parental imprinting and human syndromes caused by disruption of that process.	W1, W2, W3, W4, U3, K1, K3	Lecture, Laboratories
5.	X-inactivation and its significance in development.	W1, W2, W3, W4, U3	Lecture, Laboratories
6.	Posttranscriptional regulation of development, involvement of RNA-binding proteins and small RNAs.	W1, W2, W3, W4	Lecture
7.	Molecular mechanisms of ageing, from Drosophila up to humans.	W1, W2, W3, W4, U1, K1	Lecture
8.	Following animal development in model organisms.	W1, W2, W3, W4, U1, U2, K2, K3	Lecture, Laboratories
9.	Organ and tissue development on the example of the epidermis and hair follicle.	W1, W2, W4, U2, K3	Lecture, Laboratories
10.	Transcriptional and epigenetic regulation of development.	W1, W2, W4, U3, K3	Lecture, Laboratories

Additional information

Activities	Teaching and learning methods and activities
Lecture	Lecture with a multimedia presentation of selected issues, Problem-based lecture, Discussion, Audio and/or video demonstrations
Laboratories	Discussion, Problem-based learning, Solving tasks (e.g. computational, artistic, practical), Laboratory method, Demonstration and observation, Work in groups, Individual correction, Solving practical tasks

Activities	Credit conditions
Lecture	At the oral exam, four questions are asked from different lectures. Answers for each of the four questions are scored from 1-10. To pass, each question has to be answered in a satisfactory way >=5 points. The duration of the exam is 20 minutes per person. Points Mark <20 failed 20-23 3.0 24-27 3.5 28-31 4.0 32-35 4.5 >35 5.0
Laboratories	Requirements for passing the practical course: 1. Passing entrance test with minimum 50% (can be retaken if needed), contributes 20% to final mark. 2. Presence and active participation during the course. 3. Preparation of a 4-part report from the exercises (each contributes 20% to final mark). 4. Preparation of a group presentation. Scoring: maximum 10 points for entrance test, maximum 10 points each report part, 50 points total. Points Mark <25 failed 25-35 3.0 35-38 3.5 38.1-41.9 4.0 42-45 4.5 >45 5.0 Additional activity and engagement based on group discussions and oral statements during the course is evaluated and can lead to increasing the final mark by up to 0.5.

Literature

Obligatory

1. Up to date literature is provided to the students at the beginning of the course.

Optional

1. Up to date literature is provided to the students at the beginning of the course.

Calculation of ECTS points

Activities	Activity hours*
Lecture	20
Laboratories	22
Preparation for classes	15
Reading the indicated literature	10
Report preparation	20
Preparation for the exam	20
Preparation of a multimedia presentation	1

Student workload	**Hours** 108
Number of ECTS points	**ECTS** 4

* academic hour = 45 minutes

Efekty uczenia się dla kierunku

Kod	Treść
BTY_K2_K01	The graduate is ready to critically assess knowledge and use it in solving research and technological problems
BTY_K2_K02	The graduate is ready to improve and update their knowledge of biotechnology and related areas of study
BTY_K2_K03	The graduate is ready to cooperate with specialists representing related areas of study
BTY_K2_K05	The graduate is ready to observe, disseminate, and develop the principles of bioethics and professional ethics as well as intellectual and industrial property regulations, and accept liability for the team's working safety and hygiene, specifically when handling biological material
BTY_K2_U01	The graduate can independently select and use the tools and methods for solving research and technological problems, and act based on state-of-the-art findings of science, including medical biotechnology
BTY_K2_U03	The graduate can creatively utilize and update their knowledge of biotechnology – identify, formulate, and solve research problems, conduct critical analysis and selection of information coming from publicly available sources
BTY_K2_U05	The graduate can use English language and specialist terminology related to natural sciences, in accordance with requirements for level B2+ of CEFR (Common European Framework of Reference for Languages)
BTY_K2_U06	The graduate can organize teamwork and cooperate with other individuals assuming various roles within the group
BTY_K2_U07	The graduate can design their self-education, improve professional competence, and advise other individuals on their education
BTY_K2_W02	The graduate knows and understands issues related to the use of living organisms in biotechnological solutions for medical applications
BTY_K2_W03	The graduate knows and understands at the advanced level – complex biological phenomena at different levels of the hierarchical organization of life and their importance to biotechnology
BTY_K2_W04	The graduate knows and understands mechanisms of the functioning of organisms under the physiological norm and pathological conditions
BTY_K2_W08	The graduate knows and understands at the advanced level – the laws and rules of ethics concerning biotechnological and biomedical research, and biomaterials as well as protection of personal data, intellectual and industrial property rights
BTY_K2_W09	The graduate knows and understands at the advanced level– the categories of notions in natural sciences and other sciences, and specialist terminology, specifically in the field of biotechnology