

Developmental Biology

Code: 101984
ECTS Credits: 6

Degree	Type	Year	Semester
2500890 Genetics	OB	2	2

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Prerequisites

Knowledge needed to correctly follow the course:

- To know and understand the basic fundamentals of the subjects of the first course: Genetics, Cell Biology and Histology.
- Know and understand the basic fundamentals of the subject Molecular biology of eukaryotes in the first semester of the second year.
- Oral and reading comprehension of English.

Objectives and Contextualisation

Developmental biology is the science that studies the causes and processes by which an egg cell gives rise over time to an adult organism development characterized by having different types of cells (cell differentiation) and a specific spatial distribution of these (pattern formation and morphogenesis).

The course begins with a phenomenological level description of the nature of the development process, what are the main questions the biology and genetics of development and the relationship between development and evolution.

The second part of the course explains in detail the current knowledge about the causes and mechanisms of pattern formation and morphogenesis in animals. We will especially insist on understanding the logic of these mechanisms. At this stage we will explain the best known examples for each model species regardless of their phylogenetic position. We will also insist on how to integrate all levels of organization, from gene interactions to mechanical interactions in tissues and large groups of cells.

The third part of the syllabus explores the diversity of animal development. The developmental processes studied separately in the second half of the course will related between them by studying the entire development of specific species.

The fourth part explores how what the students have learned about how to shape morphology can help you understand how this morphology varies and may vary in evolution. We will introduce specific examples of the evolution of development and the basic principles of how development affects the direction of evolutionary change.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Be able to analyse and synthesise.
- Be able to communicate effectively, orally and in writing.
- Describe the diversity of living beings and interpret it evolutionally.
- Describe the genetic bases of the development and control of genic expression.
- Develop self-directed learning.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Reason critically.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Use and manage bibliographic information or computer or Internet resources in the field of study, in one's own languages and in English.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Be able to analyse and synthesise.
3. Be able to communicate effectively, orally and in writing.
4. Describe the mechanisms for regulating genic expression in viruses, bacteria and eukaryotes.
5. Develop self-directed learning.
6. Enumerate and describe the basic mechanisms of pattern-forming in animals.
7. Explain the role of tool genes in development.
8. Explain the role of tool genes in the origin of morphological diversity.
9. Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
10. Reason critically.
11. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
12. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
13. Use and manage bibliographic information or computer or Internet resources in the field of study, in one's own languages and in English.

Content

Topic 1: Introduction to the phenomena and fundamental questions of developmental biology and evolution.

Topic 2: basic cell behaviors involved in the development.

Topic 3: Levels of gene regulation.

Topic 4: Methods

Topic 5: Basic mechanisms of pattern formation: independent mechanisms and inductive mechanisms

Topic 6: Morphogenetic mechanisms.

Topic 7: Diversity of animal development.

Topic 9: Hirudinia.

Topic 9: "Small phyla."

Topic 10: Arthropods, Drosophila.

Topic 11: Equinoïdeus and tunicates.

Topic 12: zebrafish.

Topic 13: Anura and salamander.

Topic 14: Chicken and mouse.

Topic 15: Development of organs I: Wing Drosophila and legs.

Topic 16: Development of organs II: vertebrate limbs.

Topic 17: Development of organs III: teeth.

Topic 18: Examples of developmental evolution.

Topic 19: Role of disparities in development and animal evolution. Examples desevolupamental origin of morphological variation.

Methodology

The teaching methodology includes three types of activities: lectures, problem solving and tutorials.

Lectures: they are used to provide students with the basic conceptual and the minimum information necessary so that you can then develop independent learning. Used computer resources (ppt presentations) will be available to students on moodle.

Seminars and problems: problems of seminars will be held in small groups (max. 30 students). The students should solve problems that previously delivered by the teacher, which will help to learn to reason and apply knowledge.

Tutorials: There will be tutoring students on request. There will be also tutoring classroom with groups of 30 students if agreed with the students before exams. The aim of these sessions will be to answer questions, review basic concepts and guidance on information sources consulted.

The professor would allow 15 minutes of a lecture to fill the questionnaires about teaching evaluations.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
lectures	15	0.6	4, 5, 6, 7, 8, 10, 3, 2, 13
problem solving	30	1.2	4, 6, 7, 8, 10, 3, 2, 13
Type: Supervised			
exams	8	0.32	4, 5, 6, 7, 8, 10, 3, 2, 13

problem solving	30	1.2	4, 5, 6, 7, 8, 10, 3, 2, 13
studying and bibliography reading	6	0.24	4, 5, 6, 7, 8, 10, 3, 2, 13
tutorials	38	1.52	4, 5, 6, 7, 8, 10, 3, 2, 13

Assessment

-Quiz 1 for the first 25% of the topics on the course (10% of the assessment).

- First partial exam for the first 50% of the topics of the course (40% of the assessment).

-Quiz 2 for the first 25% of the second part of the course (10% of the assessment).

- Second partial exam for the second 50% of the topics of the course (40% of the assessment).

-Recover exam

To pass the course a 5 or more in the weighted mean of the exams is required. Those that do not pass can take a recovering examen. In that last case the grade of the course will be the grade of this last exam. To be able to attend this last examen a students needs to have take part in the two previous partial exams.

The exam consists of multiple conceptual questions and problems.

The quiz would consist in short questions. The quiz will be done in the lecture rooms.

No evaluable

A student would be considered "No Evaluable" if he/she does not take part in any of the partial exams.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
First partial exam	40%	7.5	0.3	4, 5, 6, 7, 8, 10, 3, 2, 13
Quiz 1	10%	4	0.16	1, 12, 11, 4, 5, 6, 7, 8, 9, 10, 3, 2, 13
Quiz 2	10%	4	0.16	4, 5, 6, 7, 8, 10, 3, 2, 13
Second partial exam	40%	7.5	0.3	4, 5, 6, 7, 8, 10, 3, 2, 13

Bibliography

Scott F. Gilbert & Barresi MJF. Developmental Biology, Ninth Edition. 2019. Sinauer Associates, Sunderland, MA.

Forgács and Newman. The Physics of the developing embryo. 2005. Cambridge University Press

Salazar-Ciudad, I., Newman, S.A. and Jernvall, J. (2003). Development.

Salazar-Ciudad, I. (2010). Development.

Software

None