

**Developmental Biology**

Code: 101984  
ECTS Credits: 6

| Degree           | Type | Year | Semester |
|------------------|------|------|----------|
| 2500890 Genetics | OB   | 2    | 2        |

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

**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

- 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.
- Reason critically.
- 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. Be able to analyse and synthesise.
2. Be able to communicate effectively, orally and in writing.
3. Describe the mechanisms for regulating genic expression in viruses, bacteria and eukaryotes.
4. Develop self-directed learning.
5. Enumerate and describe the basic mechanisms of pattern-forming in animals.
6. Explain the role of tool genes in development.
7. Explain the role of tool genes in the origin of morphological diversity.
8. Reason critically.
9. Use and manage bibliographic information or computer or Internet resources in the field of study, in one's own languages and in English.

## Content

Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

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 8: Nematodes.

Topic 9: Hirudinia.

Topic 10: "Small phyla."

Topic 11: Arthropods, Drosophila.

Topic 12: Equinoïdeus and tunicates.

Topic 13: zebrafish.

Topic 14: Anura and salamander.

Topic 15: Chicken and mouse.

Topic 16: Development of organs I: Wing Drosophila and legs.

Topic 17: Development of organs II: vertebrate limbs.

Topic 18: Development of organs III: teeth.

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

Topic 20: Examples of developmental evolution.

In case of confinement topic from the 1 to the 7 and from the 19 to the 20 will be prioritized.

## Methodology

The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities

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.

## Activities

| Title                             | Hours | ECTS | Learning Outcomes         |
|-----------------------------------|-------|------|---------------------------|
| Type: Directed                    |       |      |                           |
| lectures                          | 15    | 0.6  | 3, 4, 5, 6, 7, 8, 2, 1, 9 |
| problem solving                   | 30    | 1.2  | 3, 5, 6, 7, 8, 2, 1, 9    |
| Type: Supervised                  |       |      |                           |
| exams                             | 8     | 0.32 | 3, 4, 5, 6, 7, 8, 2, 1, 9 |
| problem solving                   | 30    | 1.2  | 3, 4, 5, 6, 7, 8, 2, 1, 9 |
| studying and bibliography reading | 6     | 0.24 | 3, 4, 5, 6, 7, 8, 2, 1, 9 |
| tutorials                         | 38    | 1.52 | 3, 4, 5, 6, 7, 8, 2, 1, 9 |

## Assessment

Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

-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 take the second partial exam, a grade larger or equal than 4 is required in the first partial examen. If that is not the case the student should go to the recover exam.

To pass the course a 5 or more in the weighted mean of the exams and quizzes 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.

The exam consists of multiple choice questions (20% of the grade) and conceptual problems.

The quizzes will take 1 hour.

No evaluables

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  | 3, 4, 5, 6, 7, 8, 2, 1, 9 |
| Quiz 1              | 10%       | 4     | 0.16 | 3, 4, 5, 6, 7, 8, 2, 1, 9 |
| Quiz 2              | 10%       | 4     | 0.16 | 3, 4, 5, 6, 7, 8, 2, 1, 9 |
| Second partial exam | 40%       | 7.5   | 0.3  | 3, 4, 5, 6, 7, 8, 2, 1, 9 |

## Bibliography

The basic textbook is:

Scott F. Gilbert. Developmental Biology, Ninth Edition. 2010. Sinauer Associates, Sunderland, MA.

Recommended optional sources are:

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

Slack, J. Essential developmental biology. 200Second edition.