

Degree	Type	Year
2501230 Biomedical Sciences	OB	2

## Contact

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## Teachers

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## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

It is highly advisable that students know the embryology content of Human Anatomy subjects, as well as the bases of cell biology and genetics of the subjects: Genetics, Cell Biology, Molecular Biology of the Cell and Human Genetics. The teaching of the subject Biology of development and Teratology is organized on the basis that the students must have learned a series of previous concepts of these subjects.

It is recommended that students have sufficient knowledge of English as many of the sources of information in developmental biology and teratogenesis are in this language

## Objectives and Contextualisation

Biology of Development and Teratology is a compulsory subject of 6 ECTS where teaching activities are developed with the aim that students know, understand and learn:

- the genetic, cellular and embryological bases of normal and abnormal development,
- the processes and mechanisms of the normal development of the organs and systems of the human body, at a deeper and more specific level than that achieved in other subjects of the first two courses (see Prerequisites), in which the level is more basic.
- the processes and mechanisms involved in the genesis of congenital defects (teratogenesis)
- the bases of experimental embryology and the main experimental models

On the other hand, the subject Biology of development and Teratology is complemented with a practical training in the laboratory in the subject Laboratory 2 and is related to the subjects Medical Genetics (third course) and Genetics and Reproduction (optional).

## Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Display knowledge of the bases and elements applicable to the development and validation of diagnostic and therapeutic techniques.
- Display knowledge of the concepts and language of biomedical sciences in order to follow biomedical literature correctly.
- Display theoretical and practical knowledge of the major molecular and cellular bases of human and animal pathologies.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Read and critically analyse original and review papers on biomedical issues and assess and choose the appropriate methodological descriptions for biomedical laboratory research work.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- 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.
- Work as part of a group with members of other professions, understanding their viewpoint and establishing a constructive collaboration.

## Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Contrast the techniques and methods that allow genetic diagnosis.
3. Correctly use the terminology of genetics and its text and reference books
4. Design methodologies for the experimental study of genetic diseases.
5. Discern the principal morphogenetic processes and their chronology, and understand the significance of possible alterations to these.
6. Identify chromosome variants and anomalies, understand the mechanisms that originate them and determine the risk of their transmission to descendants.
7. Identify the genetic bases of human development.
8. Identify the genetic bases of the principal diseases with a genetic base or component.
9. Interpret genetically the diagnosis, prognosis, prevention and therapy for the most frequent genetic pathologies in the human population.
10. Interpret scientific publications and solve problems and typical cases in the area of cytogenetics.
11. Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
12. Recognise the anomalies of human chromosomes and assess their consequences.

13. Relate genetic dysfunction to the pathological phenotype.
14. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
15. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
16. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
17. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
18. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
19. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
20. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
21. Understand scientific texts on genetics and development, and write review papers on them.
22. Understand the principal experimental techniques in embryology and teratology and their use in basic and applied research.
23. Work as part of a group with members of other professions, understanding their viewpoint and establishing a constructive collaboration.

## Content

### BLOCK 1.- GENERAL ASPECTS OF THE DEVELOPMENT BIOLOGY AND TERATOGENY:

- 1) Concepts, history and scientific-professional fields of application
- 2) Normal development in the human
  - a) Preparation for pregnancy:
    - i) Gametogenesis
    - ii) Preparation of the female genital tract for pregnancy
    - iii) Gamete transport and fertilization
  - b) Prenatal development: Human embryonic and fetal periods:
    - i) Segmentation of the zygote: properties of development during segmentation
    - ii) Transport and Implantation of the blastocyst. ectopic pregnancy
    - iii) Formation of the bilaminar embryonic disc, the amniotic, vitelline and chorionic sacs, of the extraembryonic mesoderm and the chorion
    - iv) Gastrulation: formation of the trilaminar embryonic disc. Derivatives of the germinal layers.
    - v) Embryonic organogenesis
    - vi) Fetal period.
    - vii) Estimation of the degree of development and gestational age.
  - c) Postnatal development: breastfeeding, childhood, adolescence, initial adulthood.
  - d) Development of the placenta and fetal adnexal membranes

e) Cell biology and development genetics:

i) Cell differentiation and control of gene expression

ii) Proliferation and cell death

iii) Cell adhesion and Morphogenesis

iv) Genes of control of embryonic development. Gene families

v) HOX genes and genes with Homeobox. Normal functions and associated pathologies

vi) Growth factors and associated pathologies

vii) WNT family and BMP. associated pathologies

viii) Hedgehog Genes. associated pathologies

ix) Genetic control of the formation pattern. Gastrulation

x) Biology and molecular genetics of the early stages of development

xi) Establishment of the embryo body plan

xii) Neurulation

xiii) Somitogenesis. Segmentation clock

xiv) Differentiation of muscle cells

f) Embryology of multiple gestations and associated congenital pathologies.

3) Abnormal development in humans:

a) Concept of physical congenital defects (FCD) and congenital anomaly. Incidence and health repercussions.

b) FCDs: Classification:

i) According to severity: FCD higher and lower

ii) According to the pathogenesis: Primary and secondary FCDs: deformation; disruption; malformation and dysplasia

iii) According to clinical presentation. Simple and multiple FCDs: syndrome; association and sequence.

c) Teratogenicity:

d) Factors and teratogenic agents.

(1) Genetic factors: Microduplications and chromosomal microdeletions. epigenetics and developmental alterations.

(2) Environmental factors: Basic principles in teratogenesis. Pathogenesis of congenital malformations.

(3) Multifactorial inheritance

ii) Epidemiology of congenital defects

4) Experimental embryology.

a) Principles of experimental embryology

b) Study techniques.

5) Comparative embryology: Biological bases and experimental animal models. EVO-DEVO

**BLOCK 2.- MOLECULAR, CELLULAR, TISSUE, GENETIC AND EMBRYOLOGICAL BASES OF THE NORMAL DEVELOPMENT AND THE PHYSICAL CONGENITAL DEFECTS OF THE APPARATUS AND SYSTEMS IN THE HUMAN.**

1) Normal and anomalous development of integuments

2) Normal and abnormal development of the trunk: parietal elements and cavities

3) Normal and abnormal development of the limbs

4) Normal and abnormal development of the pharyngeal apparatus and the craniofacial massif

5) Normal and abnormal development of the nervous system, the neural crest and the sense organs

6) Normal and abnormal development of the circulatory system and blood cells

7) Normal and abnormal development of the digestive and respiratory systems

8) Normal and abnormal development of the urinary and genital apparatus

9) Chromosomal syndromes

10) Development mechanisms involved in cancer and regeneration

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classroom practices	9	0.36	22, 21, 2, 4, 9, 10, 12, 23
Lectures	36	1.44	2, 5, 8, 7, 6, 9, 12, 13, 3
Type: Supervised			
Face-to-face and virtual tutors	5	0.2	22, 21, 2, 4, 5, 8, 7, 6, 9, 10, 12, 13, 23, 3
virtual Lectures	10	0.4	22, 21, 2, 4, 5, 8, 7, 6, 9, 10, 12, 13, 3
Type: Autonomous			
Documentation search	5	0.2	22, 21, 10, 23, 3
Reading of texts	10	0.4	21, 10, 23, 3
Study	58	2.32	22, 21, 2, 4, 5, 8, 7, 6, 9, 10, 12, 13, 3
work production	12	0.48	22, 21, 2, 4, 5, 8, 7, 6, 9, 10, 12, 13, 23, 3

Theoretical classes: They are programmed so that the students acquire the scientific knowledge related to the general aspects of the normal development in the human and, more specifically, with the molecular, tissular, genetic and embryological bases of the normal development and malformations

Classroom practices: The topics 1.3.ci.1, 1.5 and 2.10 are dealt with in classroom practices. In addition there will be classroom practices dedicated to the preparation, presentation and discussion of scientific articles related to the subject.

Virtual learning: Some aspects of the sections treated in the theoretical classes and classroom practices, must be obtained from teaching material provided through the virtual campus of the UAB.

Work in groups: Work teams consisting of three or four students, must do the critical analysis of scientific articles related to development biology and / or teratogenesis, submit a written report (abstract in Catalan, Spanish and English) and do them an oral presentation in public.

In any of the above-mentioned training activities, students are encouraged to learn autonomous learning, with which they must essentially complete their training.

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.

## Assessment

### Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Assessment of teamwork	25%	1	0.04	1, 20, 19, 21, 2, 4, 5, 8, 7, 6, 9, 10, 11, 16, 14, 15, 12, 13, 23, 3
Partial evaluations	60%	3	0.12	22, 21, 2, 4, 5, 8, 7, 6, 9, 10, 18, 17, 12, 13, 3
continued evaluation	15%	1	0.04	22, 21, 2, 4, 5, 8, 7, 6, 9, 10, 12, 13, 3

#### A. Continued evaluation:

1. Follow-up evaluations: Along the course, the students will do evaluation exams or short works, related to the subject. The value of the average grade obtained in the follow-up assessments will represent 15% of the final mark.

2. Assessment of teamwork: It will represent 25% of the final mark. The qualification obtained can be modified individually if it is considered that the participation in the work of the group is much lower than expected. If a student does not attend the public presentation of the work, they will be qualified with half of the score obtained by the team. Those students who register for the second or more times on the subject and have carried out the activity in previous courses, having obtained a qualification equal or superior to 5 (in scale of 0-10 points), will be exempt to realize the activity in the current course where it will be applied the previously obtained mark. However, this exemption can be waived by participating in the activity of the current course, knowing that by calculating the final grade, the work mark corresponding to the last participation in the activity will be applied. This exemption will remain as long as the regulations have not changed.

3. Partial evaluations: Two objective tests are scheduled, each of which will include all the contents of each Block. They will consist of individual test exams with five options and one valid (penalization of 0.25 points for each incorrect answer). The mark of each test will represent 30% of the global mark of the subject.

4. Recovery exam: In order to participate in the recovery, the students must have been previously evaluated in a series of activities whose weight equals to a minimum of two thirds of the global grade of the subject or module. Recovery of each one of the partial evaluations will be carried out, with the same weighting as in the previous ones. In this exam can also participate the students who wish to improve their qualification, either to obtain the grade of sufficiency or to improve the previously obtained mark. In any case, the marks obtained in the recovery exam will only be applied when they represent an improvement of the qualification obtained previously.

Sufficiency mark: The sufficiency in the subject will be obtained with a weighted grade equal to or greater than 5 (scale 0-10). In order to make the weighted sum of all the marks included in the continuous assessment of the subject, it will be necessary to obtain a note greater than or equal to 4 in each partial evaluation. In the event that this requirement is not met, the final mark may not be greater than 4 points (scale 0-10)

Synthesis Test: From the second registration, students will be able to opt for an examination of the totality of the subject of the subject instead of the exam of recovery of the continuous evaluation. The mark achieved the synthesis test will represent up to 75% of the final mark and the remaining 25% will correspond to the qualification achieved in team work. The mark that results from the weighted sum of these two grades will be the final mark of the subject.

Not evaluable: Students will obtain the "Non-Valuable" qualification when the evaluation activities carried out have a weighting of less than 67% in the final grade.

## B. Single evaluation

### Test of evaluation of theoretical knowledge (60 % of the mark of the single evaluation)

It consists of an objective test (multiple choice type) in which the contents of the theoretical classes and the theoretical contents of the classroom practices will be evaluated.

### Teamwork (25% of the mark of the single evaluation)

This work will have the same characteristics as that carried out in the continuous evaluation with the following particularities:

1. The work will be individual.
2. There will be no delivery of a preliminary report.
3. The oral presentation will be made in the single evaluation session.
4. The written work will represent 70% of the grade of the activity and the oral presentation will represent 30% of the grade of the work.

### Follow-up evaluations (15% of the mark of single evaluation)

They will have the same characteristics as in the continuous evaluation with the difference that the delivery will be made on the day of the single evaluation.

### Recovery

In the recovery, only the objective test of theoretical knowledge of the same characteristics of that carried out in the first instance of the single evaluation will be carried out. From the "teamwork" and the "follow-up evaluations" the grade obtained in the first instance will be preserved.

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## Software

For the development of the subject is enough with the Microsoft Office pack.

## Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	521	Catalan/Spanish	second semester	morning-mixed
(PAUL) Classroom practices	522	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	52	Catalan/Spanish	second semester	afternoon