

**Genetics and Reproduction**

Code: 101891  
ECTS Credits: 3

Degree	Type	Year	Semester
2501230 Biomedical Sciences	OT	4	1

## Contact

Name: Juan Blanco Rodriguez

Email: joan.blanco@uab.cat

## Teaching groups languages

You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

## Prerequisites

To ensure proper monitoring of the subject and the achievement of the learning outcomes, it is recommended:

1. Familiarize and understand the basic foundations of the first-year subjects: "Cellular Biology and Histology" and "Genetics."
2. Familiarize and understand the basic foundations of the second-year subjects: "Cytogenetics."
3. Acquire knowledge of the techniques used in these disciplines, as many of them will be introduced throughout the course and assumed to be known.

## Objectives and Contextualisation

Sexual reproduction in most species is associated with sexual dimorphism and the presence of chromosomes that determine sex. Sexual dimorphism is achieved through the involvement of specific genes involved in differential sexual development. Mutations in these genes condition sexual differentiation and, therefore, the fertility of affected individuals. On the other hand, gametogenesis is a complex and highly regulated process. Dysfunctions or abnormalities affecting one or more stages involved in the formation of sperm and oocytes can impair the reproductive capacity of affected individuals. To date, the relationship between various genotypic alterations and their effect on the reproductive capacity of individuals has been established. Generally, the manifestation of genetically originated infertility is associated with a significant reduction in the number of produced gametes, abnormalities in embryonic development, or spontaneous abortions.

In this context, the objectives of the subject will focus on:

1. Establishing the genetic causes that condition reproduction in humans.
2. Reviewing genetic analysis techniques aimed at the characterization of gametes and preimplantation embryos.
3. Determining the risk of transmission of genetically caused infertility.

4. Establishing the foundations for reproductive genetic counseling.

## Competences

- Display knowledge of the bases and elements applicable to the development and validation of diagnostic and therapeutic techniques.
- Display knowledge of the basic life processes on several levels of organisation: molecular, cellular, tissues, organs, individual and populations.
- 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.

## Learning Outcomes

1. Correctly use the terminology of genetics and its text and reference books
2. Describe and understand the genetic bases and control of human gametogenesis.
3. Describe and understand the genetic bases of sex determination and differentiation in humans.
4. Describe the genetic techniques for the study and prevention of sterility and infertility.
5. Evaluate the involvement of genetic anomalies as a cause of infertility.
6. Interpret scientific publications and solve problems and typical cases in the area of cytogenetics.
7. Provide pre-conceptional genetic counselling, taking ethical and legal factors into account.
8. Recognise genetic anomalies in spermatogenesis and oogenesis related to a phenotype of sterility.
9. Understand and describe the structure, morphology and dynamics of eukaryote chromosomes in the different stages of the cell cycle.

## Content

### SECTION I: GENETIC BASIS OF REPRODUCTION

Topic 1. Sex determination and differentiation in humans

Topic 2. Genetic control of human gametogenesis

### SECTION II: GENETIC BASIS OF HUMAN INFERTILITY

Topic 3. Genetic basis of male infertility

Topic 4. Genetic basis of female infertility

### SECTION III: GENETIC DIAGNOSIS AND ASSISTED HUMAN REPRODUCTION

Topic 5. Introduction to human-assisted reproduction techniques

Topic 6. Genetic studies in infertile couples

Topic 7. Preimplantational genetic diagnosis

Topic 8. Preconceptional genetic studies in gamete donors and couples with a reproductive desire

## Methodology

### Theory Classes

The content of the theory program will be explained by the teacher in 22 sessions of 50 minutes with audiovisual support, encouraging active student participation. The tables, figures, and graphs used in the sessions will be available in PDF format in the Moodle classroom of the subject. Students will also have access through this platform to recommended videos, animations, and websites, and will receive detailed bibliography for each topic, which they should consult to consolidate the theoretical classes and for personal study of the explained topics.

### Problem Classes

Students will be organized into groups of four and must attend the corresponding sessions in the group assigned by the degree coordination. Each student will complete 4 sessions of 50 minutes during the course. The organization in the classroom will be as follows:

1. Students will have a list of problems to solve in advance.
2. For each scheduled session, students will work on 3 to 4 problems and prepare a response dossier.
3. Before each session, each team will submit the response dossier (a group submission) in the designated space in the Moodle classroom of the subject.
4. The problems will be solved in the classroom on the assigned day according to the subject's calendar. The teacher will choose a student who will perform an oral presentation to the rest of the students.
5. The problem-solving and presentation will be evaluated by the teacher, and the grade obtained will be applied to all members of the team to which the student belongs.
6. At the end of each session, the teacher will select and grade a problem from the dossier. The grade obtained will be applied to all members of the work team and will contribute to the final grade of this activity.

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.

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## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	22	0.88	9, 3, 2, 4, 7, 8, 1, 5
Problem sessions	4	0.16	3, 2, 4, 6, 7, 8, 1, 5
Type: Autonomous			
Problem resolution	16	0.64	6, 7, 8, 1, 5
Study and self learning concepts	27	1.08	9, 3, 2, 4, 6, 7, 8, 1, 5

## Assessment

To pass the subject, it will be essential to obtain a final grade equal to or higher than 5 points out of 10 based on the contributions from different evaluation activities. Additionally, students must achieve a minimum grade in the average of the two written exams equal to or higher than 4 points out of 10.

### Written Exam I and Written Exam II (individual evaluation)

Throughout the semester, two written tests (consult the subject's schedule) on the theoretical contents of the subject will be conducted, which students must individually respond to. The tests will consist of multiple-choice questions aimed at assessing the mastery of concepts and knowledge covered in class and verifying their correct application and interrelation. Each of the tests will have a weight of 40% on the final grade of the subject. Students must obtain a minimum grade in the average of both tests of 4 points (out of 10) in order to pass the subject.

### Problem Solving (group evaluation)

The grade for this part will be obtained through the average of the scores obtained by each group of students throughout the course (one problem per dossier) and through the oral resolution in class. The teacher will ensure that each group presents at least one exposition during the course. A problem not submitted or not solved in class will be scored as zero in the group's average grade calculation. The evaluation of the problems will take into account the correctness of the answer, the formulation, and the interpretation of the results. The final grade will be shared by all members of each group and will account for 20% of the final grade.

### Recovery Exam

There will be a recovery exam for those students who have not achieved the required grade in the partial exams evaluating the theoretical contents (average of 4 out of 10) or who have not reached the minimum grade to pass the subject (5 points out of 10). To participate in the recovery exam, students must have been previously evaluated in a set of activities that account for at least two-thirds of the total grade of the subject. Therefore, students will receive a "Not evaluable" grade when the weight of the evaluation activities is less than 67% of the final grade. To include the grade obtained in the recovery exam in the final grade of the subject, it will be necessary to achieve a grade of 4 out of 10 in that exam.

### Single Evaluation

Students will have the option to be evaluated on the theoretical contents of the subject through a single written exam (individual evaluation), which will account for 80% of the final grade. The remaining 20% will be based on problem-solving, which will be continuously evaluated throughout the course (see previous section). This exam will be of the same type as the two exams scheduled for the continuous evaluation of the theoretical contents. It will take place on the same date specified in the calendar for Written Exam II, and the same recovery system as the continuous evaluation will be applied.

Students who choose this modality must inform the responsible professor of the subject before the first working day of October.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Problem resolution	20	2	0.08	3, 2, 4, 6, 7, 8, 1, 5
Written examination I	40	2	0.08	9, 3, 2, 6, 8, 1
Written examination II	40	2	0.08	4, 7, 8, 1, 5

## Bibliography

Bajo JM, B. Coroleu B. (Eds.) Fundamentos de Reproducción. Editorial Panamericana. Madrid. 2009.

Elder K., Dale B. In vitro fertilization. (3rd edition). Cambridge University Press. New York. 2011.

Fauser B.C.J.M. (Ed.). Molecular Biology in Reproductive Medicine. The Parthenon Publishing Group. New York. 1999

Gardner D.K. et al. (Eds.). Textbook of Assisted Reproductive Techniques. Martin Dunitz Pub. Hampshire. 2001.

Harper J. (Ed.) Preimplantation Genetic Diagnosis. (2nd Edition). Cambridge University Press. New York (USA).2009.

Johnson M.H. and Everitt B.J. (Eds.) Essential Reproduction. 5th Edition. Blackwell Science. Oxford. 2005.

Matorras R, Hernández J. (Eds.). Estudio y tratamiento de la pareja estéril. Adalia. Madrid. 2007.

Specific review articles will be recommended during the course.

## **Software**

Not applicable