UAB
Universitat Autònoma de Barcelona

Technology of Reproduction

2026/2027

Code: 100760
Credits: 6

Degree programme	Type	Course
Biology	OP	4

Contact lecturer

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Teaching staff

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Group languages

You can consult this information at the end of the document.

Prerequisites

There are no formal prerequisites for this subject. However, to ensure effective engagement with the course and successful achievement of the learning outcomes, it is recommended that students possess basic prior knowledge of Cell Biology and the techniques commonly used in this field.

Additionally, given that in a scientific discipline such as Reproductive Biology most information sources in are in English, a sufficient level of proficiency in this language is strongly recommended.

Objectives

The course Reproductive Technology aims to provide students with knowledge of the cellular mechanisms involved in mammalian reproduction, as well as of the practical applications of gamete and preimplantation embryo manipulation and their implications in both human reproduction and animal reproduction and production. The theoretical content is complemented by the acquisition of basic experience in the manipulation of preimplantation embryos.

The first part of the syllabus constitutes a core section of the course and its main objective is to provide knowledge about gamete formation, fertilization, and preimplantation embryonic development, while also offering the foundations needed to understand the techniques covered in the subsequent thematic blocks. The second part of the syllabus focuses on fertility control and assisted reproduction techniques applied in humans and animal species, as well as on providing an overview of some current embryonic biotechnologies such as cloning, stem cells, and genetic modification of embryos.

The learning objectives are that, upon completion of the course, students will be able to:

1. Explain the processes of formation and maturation of female and male mammalian gametes.
2. Describe the mechanisms of fertilization and oocyte activation.

3. Describe the main events of preimplantation embryonic development and their cellular and molecular basis.
4. Identify the biological and technical foundations of contraceptive methods and the causes of infertility in humans.
5. Analyze the main assisted reproduction techniques and preimplantation genetic diagnosis in humans, assessing their applications, limitations, and risks.
6. Explain the principles and basic protocols of gamete and embryo cryopreservation.
7. Compare reproductive cycles and technical strategies for fertility control and assisted reproduction in humans and other animal species.
8. Describe the basis and applications of embryonic biotechnologies, identifying their risks and regulatory considerations.
9. Integrate and critically apply the knowledge acquired to interpret data and solve experimental problems in the field of reproductive biology and related technologies.

Learning outcomes

1. Be able to analyse and synthesise.
2. Apply statistical and computer resources to the interpretation of data.
3. 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.
4. 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.
5. 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.
6. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
7. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
8. Analyse a situation and identify its points for improvement.
9. Propose new methods or well-founded alternative solutions.
10. Critically analyse the principles, values and procedures that govern the exercise of the profession.
11. Analyse the sex- or gender-based inequalities and the gender biases present in one's own area of knowledge.
12. Propose projects and actions that incorporate the gender perspective.
13. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
14. Perform genetic diagnoses and advise on these.
15. Relate the processes of gametogenesis and fertilisation to the functioning of the human reproductive system.
16. Explain and apply the technologies deriving from intervention on gametes and embryos.
17. Obtain, manipulate and culture preimplantation mammal embryos.

Contents

THEORY

I. GAMETE FORMATION AND FERTILIZATION

Unit 1. Introduction: basic concepts

Unit 2. Female gametogenesis: oogenesis and folliculogenesis

Unit 3. Male gametogenesis: spermatogenesis

Unit 4. Epididymal maturation of spermatozoa

Unit 5. Gamete release and transport

Unit 6. Sperm capacitation

Unit 7. Fertilization

Unit 8. Oocyte activation

II. PREIMPLANTATION EMBRYONIC DEVELOPMENT

Unit 9. Preimplantation embryonic development and maternal-to-zygotic transition

Unit 10. Preimplantation embryonic metabolism

Unit 11. Formation of the morula: compaction and cell polarization

Unit 12. Formation of the blastocyst: cell differentiation and cavitation

III. CONTROL OF HUMAN FERTILITY

Unit 13. Contraception: methods and efficacy

Unit 14. Infertility: causes and diagnosis

Unit 15. The andrology laboratory

Unit 16. Assisted reproduction techniques

Unit 17. Preimplantation genetic diagnosis

Unit 18. Cryopreservation of gametes and embryos

Unit 19. Genetic risks associated with assisted reproduction techniques

IV. FERTILITY CONTROL IN ANIMALS

Unit 20. Reproductive cycle in animal species

Unit 21. Assisted reproduction techniques in animals

V. EMBRYONIC BIOTECHNOLOGIES

Unit 22. Somatic cell reprogramming and reproductive cloning

Unit 23. Stem cells and reproduction

Unit 24. Genetic modification of embryos

PRACTICAL SESSIONS

1. Embryo manipulation and *in vitro* culture
2. Embryo splitting
3. *In vitro* oocyte maturation
4. Embryo cryopreservation
5. Characterization of a semen sample

Some of these contents will be addressed through videos that students will need to watch and interpret.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Laboratory practicals	12	0.48	7, 11, 15, 16, 17
Study	73	2.92	1, 2, 4, 5, 7, 10, 11, 13, 15, 16
Tutorials	2	0.08	
Problem solving classes	2	0.08	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16
Theory classes	40	1.6	3, 4, 5, 7, 8, 10, 11, 14, 15, 16
Problem solving	16	0.64	1, 2, 4, 5, 7, 8, 9, 11, 12, 14, 15, 16

The course Reproductive Technology combines different types of learning activities in order to facilitate the acquisition of theoretical and practical knowledge, as well as the development of cross-curricular skills such as teamwork, critical thinking, and problem-solving ability. The organization and teaching methodology followed in these three types of learning activities are described below: theory classes, problem-solving classes, and laboratory practicals.

THEORY CLASSES

The theory sessions will be delivered in lecture format, supported by audiovisual materials prepared by the teaching staff. These materials will be made available in advance on the course Moodle page within the UAB Virtual Campus. Students are advised to review this material before each session and to complement their study with the recommended bibliography in order to consolidate the content covered in class.

In addition to attending classes, following the course will also require an active role from students, who will have to develop, individually or in small groups, parts of the theory syllabus based on the guidelines provided by the teaching staff. The aim is to encourage consultation of bibliographic sources and to help students learn how to search for, interpret, and synthesize information, as well as how to work independently. Any questions arising during the preparation of the content may be discussed in class with the teaching staff on the dates they indicate. The information collected by students will serve as individual study material and does not need to be submitted to the teaching staff.

PROBLEM-SOLVING CLASSES

Problem-solving classes will be devoted to solving experimental problems related to the theory syllabus. These classes are intended to reinforce theoretical content and to familiarize students with experimental techniques in reproductive biology, the interpretation of scientific data, and the resolution of problems based on real experimental situations. They also aim to foster the development of critical thinking.

Four problems will be solved in each session, and students will be expected to have worked on them beforehand outside class time. On a voluntary basis, students will present their proposed solutions to the rest of the class, and these will be discussed collectively under the guidance of the teaching staff, thereby encouraging the exchange of ideas among students and critical reflection.

LABORATORY PRACTICALS

Students will complete a total of 4 practical sessions of 3 hours each, working in pairs. During the practicals, each pair will be required to complete a questionnaire, which must be submitted to the teaching staff at the end of the sessions.

The practical sessions are designed to help students learn some of the basic techniques used in the

Reproductive Biology laboratory and to complement their theoretical training. Since they will be carried out in pairs, and each pair will need to agree on the answers to be submitted in the questionnaire, the sessions also aim to promote teamwork and critical peer discussion.

The practical manual will be available on the Virtual Campus. For each practical session, students must bring their own lab coat and the practical manual.

Students must complete the laboratory safety and biosafety questionnaire before carrying out the practical sessions or otherwise provide proof that they have already passed it.

Tutorials will be provided upon students' request to resolve doubts regarding theoretical content and problem-solving exercises.

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

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
First midterm exam of theoretical contents	35%	1.5	0.06	3, 4, 5, 7, 10, 11, 13, 14, 15, 16
Laboratory questionnaire	20%	1	0.04	7, 15, 16, 17
Second midterm exam of theoretical contents	35%	1.5	0.06	3, 4, 5, 7, 10, 11, 13, 14, 16
Problem solving 1	5%	0.5	0.02	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16
Problem solving 2	5%	0.5	0.02	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16

Continuous Assessment

Assessment for this course will be continuous throughout the semester. It will consist of various assessable activities, the weight of which in the final grade is proportional to the contact hours linked to them.

Midterm exams on theoretical content (70% of the final grade): Two written midterm exams will be held during the semester, to be completed individually. These will consist of multiple-choice questions covering the corresponding theoretical topics, including those prepared independently by students.

These exams aim not only to assess the acquisition of conceptual knowledge but also students' understanding and ability to integrate and relate concepts. By including independently studied material, they also assess information management skills, including the ability to search, analyze, and synthesize information from multiple sources.

The first exam will cover units 1-12, and the second units13-24, although the latter may also indirectly include earlier content. Each exam accounts for 35% of the final grade. A minimum score of 4/10 is required in each exam to pass the course. Scores below 4 must be retaken.

Problem-solving (10% of the final grade): Students must individually solve one problem alongside each midterm exam, similar to those practiced in class. Each problem is worth 5% of the final grade The problem

score may increase by up to 1 additional point if students voluntarily present and successfully defend a solution in class (maximum two problems; 0.5 points each). No minimum score is required for this component to be included in the final average.

Laboratory questionnaire (20% of the final grade): Laboratory sessions will be assessed through group questionnaires completed during the sessions and submitted at the end of the final session. This component accounts for 20% of the final grade and has no minimum score requirement.

Attendance at laboratory sessions is mandatory. Any absence must be justified. Unjustified absence exceeding 20% of scheduled lab hours will result in a "Not Assessed" grade.

To pass the course, students must complete all the assessment activities described and attend the laboratory sessions. The weight of each assessment component in the final grade is as described in the previous subsections and summarized in the continuous assessment activities table. Out of a total of 10 points, students must obtain a grade equal to or higher than 4 points in each of the two midterm exams on theoretical content and an overall grade equal to or higher than 5 points for all assessment activities of the course.

Students will receive a "Not Assessed" grade when the completed assessment activities account for less than 67% of the final grade or when there has been an unjustified absence exceeding 20% of the laboratory practice hours.

Single Assessment

Students opting for single assessment will take both midterms and complete both problems on the same date, coinciding with the second midterm. Lab attendance remains mandatory and the same conditions as for students following continuous assessment will be applied.

Weights of the different assessment activities and retake policies are identical to continuous assessment, including the "Not Assessed" criteria.

Reassessment

Only midterm exams of theorical contents can be retaken. If a student obtains a grade lower than 4 in either of these two exams, they must retake the exam covering the corresponding content. Students who, despite obtaining a grade equal to or higher than 4 in each of the two midterm exams, obtain an overall course grade lower than 5 based on the average of all assessment components must also retake the exam. In this case, students may retake both exams or only the one with the lower grade.

If the grade obtained in any of the reassessed exams is lower than 4, the student will not pass the course and will receive a maximum overall grade of 4 points, regardless of the average obtained from the other assessment activities of the course.

To be eligible for reassessment, students must have previously been evaluated in a set of activities equaling at least two thirds of the final grade for the subject.

The date of the reassessment exam will be the same for both students following continuous assessment and those opting for single assessment.

Students who, despite having passed the midterm exams, wish to improve their grade may also retake the exam. Reassessment will imply losing the grades previously obtained. The decision to retake the exam to improve the grade must be communicated to the teaching staff at least one week in advance.

Given that a minimum grade to pass the subject is not required in the case of the rest of the assessment

activities (problem-solving and practical quizzes), it will not be possible to retake these activities or to improve the grade.

Repeat students

Students repeating the course may retain their lab grade if it is above 5 or repeat the lab sessions. All other activities must be retaken.

Use of AI

The use of artificial intelligence (AI) technologies is not permitted at any stage. Any assessable work that includes fragments generated with AI will be considered an act of academic dishonesty and may result in a partial or total penalty in the grade for the activity, or more severe sanctions in serious cases.

Irregularities in assessment activities

The commission of any irregularity in an assessment activity (academic fraud, plagiarism, or undue use of AI, unless such use is expressly authorized in the teaching guide) that could lead to a significant variation in the mark, implies that this activity will be graded with a 0. In the event that the teaching guide stipulates that passing the subject requires a minimum grade in that specific assessment activity, or if multiple irregularities occur in the assessment activities of the same subject, the final grade for that subject will be 0. Aside from this, disciplinary proceedings may be initiated against any student who commits any of these irregularities.

Bibliography

Textbooks

Barresi M and Gilbert SF. Developmental Biology. 13th Edition, 2024. Oxford University Press.

Available in print at the library.

Carlson BM. Human Embryology and Developmental Biology. 7th Edition, 2023. Elsevier.

Available online (Spanish version)

Gardner DK, Weissman A, Howles CM, Zeev Shoham Z (Ed). Textbook of Assisted Reproductive Techniques. Volume 1: Laboratory Perspectives + Volume 2:Clinical Perspectives. 6th Edition, 2023. CRC Press.

Available in print at the library (4ª Edition, 2012).

Gordon I. Reproductive tecnologies in farm animals. 2nd Edition, 2017. CABI Publishing.

Available online (1ª Edition, 2004).

Johnson MH. Essential Reproduction. 8th Edition, 2018. Wiley.

Access to the Student Companion Website.

Available online (7ª Edition, 2013).

Santaló J, Vidal F. Biologia de la Reproducció. Problemes. 3ª Edició, 2010. Col·lecció Materials vol 63. Servei de Publicacions de la UAB.

Specific bibliography

ESHRE Guidelines, Consensus Documents and Recommendations

ISSCR Guidelines for Stem Cell Research and Clinical Translation. 2025 Update.

Throughout the course, the teaching staff will provide students with specific bibliography for each topic in the form of scientific articles.

Software

Not applies

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE