

## Development, Cell Potency and Differentiation

Code: 42944  
ECTS Credits: 6

**2025/2026**

Degree	Type	Year
Cytogenetics and Reproductive Biology	OT	0

### Contact

Name: Maria Elena Ibañez De Sans

Email: elena.ibanez@uab.cat

### Teachers

Josep Santalo Pedro

Pere Jordi Fàbregas Batlle

Marta Martin Flix

(External) Begoña Arán

(External) Laura Casado

### Teaching groups languages

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

### Prerequisites

An intermediate-advanced English level is recommended. Lectures in Unit 1 will be in English.

### Objectives and Contextualisation

This is a compulsory theoretical module in the Reproductive Biology specialization of the master's degree.

The objective of this module is to provide students with a solid knowledge of pre-implantation, and post-implantation embryo development, and foetal development in mammals, as well as of the processes of totipotency and cell differentiation that occur during development. This knowledge will allow students to understand the basis of pathologies associated with reproduction and of assisted-reproduction and cell-therapy techniques. The module will also cover the main legal and ethical aspects related to the application of these technologies.

### Competences

- Communicate and justify conclusions clearly and unambiguously to both specialist and non-specialist audiences.
- Continue the learning process, to a large extent autonomously.
- Design experiments, analyse data and interpret findings.
- Identify the ethical dilemmas and apply current laws governing the area of knowledge of the master's degree.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Recognise the cellular and molecular bases of reproduction in mammals.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use and manage bibliography or ICT resources in the master's programme, in one's first language and in English.

## Learning Outcomes

1. Apply current laws on reproductive and regenerative biology.
2. Communicate and justify conclusions clearly and unambiguously to both specialist and non-specialist audiences.
3. Continue the learning process, to a large extent autonomously.
4. Describe the bases of cell totipotency and differentiation processes.
5. Design experiments, analyse data and interpret findings.
6. Identify the cellular bases of normal and pathological embryonic and foetal development.
7. Identify the ethical dilemmas associated with research and clinical practice in reproductive and regenerative biology
8. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
9. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
10. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
11. Use and manage bibliography or ICT resources in the master's programme, in one's first language and in English.

## Content

Unit 1. Pre-implantation embryo development. Zygote activation. Embryonic metabolism. Pre-implantation gene expression. Embryo cleavage. Formation of the morula and the blastocyst. Hatching. Implantation.

Unit 2. Post-implantation embryo and foetal development in humans. Embryonic period: bilaminar embryo, gastrulation, trilaminar embryo and organogenesis. Foetal period. Mechanisms of implantation and placenta. Congenital abnormalities and prenatal diagnosis. Practical session on the observation of embryonic and foetal images.

Unit 3. Stem cells. Definition and types of stem cells. Culture and characterization of stem cells. Derivation methods. Differentiation. Applications. Ethical and legal issues.

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			

Classroom practical session	2	0.08	6
Theoretical classes	28	1.12	1, 4, 7, 6, 9, 2, 8, 10
Type: Autonomous			
Individual study	94	3.76	1, 4, 5, 7, 6, 9, 8, 3, 10, 11
Literature research and reading	20	0.8	5, 6, 9, 8, 3, 10, 11

The module will consist of lectures and a practical session on image observation (corresponding to Unit 2). Class attendance is compulsory and will be monitored.

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	Weighting	Hours	ECTS	Learning Outcomes
Class attendance and participation	10%	0	0	1, 4, 5, 7, 6, 9, 2, 8, 3, 10, 11
Multiple-choice test Unit 1	30%	2	0.08	4, 5, 6, 9, 2, 8, 3, 10, 11
Multiple-choice test Unit 3	30%	2	0.08	1, 4, 5, 7, 6, 9, 2, 8, 3, 10, 11
Written exam Unit 2	30%	2	0.08	4, 5, 6, 9, 2, 8, 3, 10, 11

Assessable activities will consist of multiple-choice tests for the contents of Units 1 and 3 (one test for each Unit) and an objective written exam for the contents of Unit 2. Assessable activities are mandatory, and each will have a weight of 30% in the final grade of the module. The aim of these activities is to assess that the students have acquired the conceptual knowledge for each unit and that they have understood and know how to integrate this information.

Class attendance and participation will also be considered in the assessment (10% of the final grade). Any absence should be duly justified by the student. Non-justified absences will affect the final mark of the module as follows: 1 absence -0.5 points; 2 absences -1 point. If the number of non-justified absences is higher than 2, the student will not be able to pass the module.

To pass the module, students must obtain an overall grade equal to or higher than 5 points. If the grade is lower than 5, students will need to retake the failed assessable activity/activities. Reassessment tests and exams will be similar to those within the continuous assessment.

To be eligible for reassessment, students should have previously been evaluated in a set of activities equal to at least two thirds of the final grade of the module.

Students will be graded as "No Available" (Not Assessable) if the weighting of all assessable work carried out is less than 67% of the final grade.

This module does not include the option for single assessment.

In this module, the use of Artificial Intelligence (AI) technologies is permitted as an integral part of the development of assignments, provided that the final result reflects a significant contribution from the student in terms of analysis and personal reflection. The student must clearly identify which parts have been generated with this technology, specify the tools used, and include a critical reflection on how these have influenced the process and the final outcome of the activity. Lack of transparency regarding the use of AI will be considered academic dishonesty and may result in a penalty in the activity's grade, or more severe sanctions in serious cases.

## Bibliography

### General bibliography:

Atala A and Lanza R. Handbook of Stem Cells. Vol 1 and 2. Academic Press. 2012. ISBN: 9780123859426.

Access to the 1st edition (2004) through the UAB library service::

[https://bibcercador.uab.cat/permalink/34CSUC\\_UAB/1c3utr0/cdi\\_scopus\\_primary\\_2\\_s2\\_0\\_84882465281](https://bibcercador.uab.cat/permalink/34CSUC_UAB/1c3utr0/cdi_scopus_primary_2_s2_0_84882465281)

Barresi MJF and Gilbert SF. Developmental Biology. Oxford University Press. 12th Edition, 2020. ISBN: 9781605358741.

Carlson B. Embriología Humana y Biología del desarrollo. Elsevier. 6th Edition, 2019. ISBN: 9788491135265.

Access to the 5th edition (2014) through the UAB library service::

[https://bibcercador.uab.cat/permalink/34CSUC\\_UAB/avjcib/alma991010481234406709](https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991010481234406709)

Access to the 6th edition through the UAB library service (registration needed):

[https://bibcercador.uab.cat/permalink/34CSUC\\_UAB/avjcib/alma991011063033306709](https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991011063033306709)

Johnson MH. Essential Reproduction. Wiley. 8th Edition 2018. ISBN: 978-1-119-24639-8.

Access to the 7th edition (2013) through the UAB library service::

[https://bibcercador.uab.cat/permalink/34CSUC\\_UAB/1eqfv2p/alma991010484814606709](https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010484814606709)

Access to the "Student Companion Website", where book images can be downloaded and tests can be taken:

<https://bcs.wiley.com/he-bcs/Books?action=index&itemId=1119246393&bcsId=11164>

Lanza R and Atala A. Essentials of Stem Cell Biology. Academic Press. 3rd Edition, 2013. ISBN: 978-0-12-409503-8.

Access through the UAB library service::

[https://bibcercador.uab.cat/permalink/34CSUC\\_UAB/1c3utr0/cdi\\_globaltitleindex\\_catalog\\_335800645](https://bibcercador.uab.cat/permalink/34CSUC_UAB/1c3utr0/cdi_globaltitleindex_catalog_335800645)

Mummery C, van de Stolpe A, Roelen B, Clevers H. Stem Cells. Scientific Facts and Fiction. Elsevier Academic Press. 3rd Edition, 2021. ISBN: 9780128203378.

Slack JMW. The Science of Stem Cells. Wiley. 2018. ISBN: 9781119235156.

Access through the UAB library service:

[https://bibcercador.uab.cat/permalink/34CSUC\\_UAB/1eqfv2p/alma991010353535106709](https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010353535106709)

### Specific bibliography:

During the module, teachers will provide students with updated specific bibliography in the form of scientific papers.

### Web links:

ISSCR Guidelines for Stem Cell Research and Clinical Translation. 2021 Update.

<https://www.isscr.org/policy/guidelines-for-stem-cell-research-and-clinical-translation>

### **Software**

No specific software will be used.

### **Groups and Languages**

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAULm) Classroom practices (master)	1	Catalan	first semester	morning-mixed
(TEM) Theory (master)	1	Catalan	first semester	morning-mixed