GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Stem Cell Biology and Reprogramming (D012549)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0 **Study time 120 h**

Course offerings and teaching methods in academic year 2025-2026

A (semester 2)	English	Gent	lecture
			peer teaching

Lecturers in academic year 2025-2026

HEINDRYCKX, BJORN	GE38	lecturer-in-charge
Chuva de Sousa Lopes, Susana Marina	GE38	co-lecturer
van Hengel, Jolanda	GE38	co-lecturer

Offered in the following programmes in 2025-2026	**crdts**	**offering**
Master of Science in Biomedical Sciences	4	A
Master of Science in Bioscience Engineering: Cell and Gene Biotechnology	4	A

Teaching languages

English

Keywords

Stem cells, reprogrammation, cell differentiation, stem cell therapy

Position of the course

With this course the students will get familiarized with new aspects in the medically oriented cell biology, in particular the cellular and molecular aspects of stem cell biology. In the theoretical course, the emphasis will lay on understanding the preservation of undifferentiated stem cells and their directed differentiation afterwards (*in vivo*, but also *in vitro* starting from embryonic stem cells and adult stem cells). The student will obtain knowledge of and insight into the regulation of these processes via networks of signal transduction cascades and genomic modifications. Based on recent review articles the student will explore in depth the details of the experimental approaches.

Contents

1) Stem cells in the body, stem cell niches
2) Stem cells *in vitro* (ESC, iPSC MSC)
3) Reprogramming: somatic cell nuclear transfer vs. iPSC
4) Pluripotent stem cells: production, derivation process, efficiency, *in vitro* culture, pitfalls, challenges
5) Different types (naïve/primed) pluripotent stem cells from human/mouse
6) Signal pathways, transcription networks and epigenetic regulation of (embryonic) pluripotent stem cells, (Epi-)genetic stability of embryonic stem cells, memory of cells
7) Mechanobiology, biomaterials and stem cells
8) Mini organs (organoids)
9) Germ cell differentiation / transdifferentiation
10) Cardiomyopathies
11) Clinical applications from pluripotent stem cells

Initial competences

Competences obtained from cell- and gene therapy and embryology are needed for Stem cell biology and reprogramming.

Final competences

1 Knowing and understanding cellular reprogrammation
2 Understanding the techniques used for stem cell biology and reprogramming and having an insight into their applications
3 Be able to critically evaluate and present published studies with and about stem cells and cellular reprogramming

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, Peer teaching

Study material

None

References

Course content-related study coaching

Assistents or lecturers during the internship.
With the lecturer(s) via e-mail or personnal appointment (possible after e-mailing).

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment, Written assessment

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Written assessment

Examination methods in case of permanent assessment

Oral assessment, Participation, Peer and/or self assessment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

Written and oral examination with open questions.
Permanent evaluation: participation, presentation and peer evaluation

Calculation of the examination mark

Periodic evaluation: 75% of total score.
Permanent evaluation: 25% of total score.
Unjustified absence in the permanent evaluation will give rise to a total maximum score of 9/20 (highest failing mark) regardless of the score on the periodic evaluation.