

Molecular Cell Biology (C004096)

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

Credits 5.0

Study time 130 h

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)

English

Gent

lecture

Lecturers in academic year 2024-2025

Vandenbroucke, Roosmarijn

WE14

lecturer-in-charge

Vereecke, Lars

GE35

co-lecturer

Offered in the following programmes in 2024-2025

[Bachelor of Science in Biochemistry and Biotechnology](#)

crdts

offering

5

A

[Bachelor of Science in Molecular Biotechnology](#)

5

A

[Exchange programme Faculty of Sciences \(bachelor's level\)](#)

5

A

[Linking Course Master of Science in Bioinformatics](#)

5

A

[Preparatory Course Master of Science in Biochemistry and Biotechnology](#)

5

A

Teaching languages

English

Keywords

Advanced microscopy, animal transgenesis, signaling cascades, cell cycle, oncogenes and tumor suppressor genes, cell death, cell differentiation, stem cells, cell migration, cell polarity

Position of the course

On the basis of the previously acquired knowledge (course General cell biology) fundamental insights and concepts in molecular cell biology will be introduced, discussed and demonstrated in more detail. Recent key articles will be used to illustrate innovating experiments and work models in molecular cell biology. Such cell biological concepts comprise cellular signaling processes, cell division versus cell differentiation and their respective complex regulations and programmed cell death.

Contents

PART 1 - Technology update

- Introduction of macromolecules in eukaryotic cells
- Genetic manipulation of animal cells and their selection
- Genetic manipulation of organisms
- Advanced light microscopy
- Advanced electron microscopy

PART II - Cell signaling and communication

- Basic principles of inter and intracellular signaling
- Signaling by G-proteins (small GTPases)
- Signaling by Receptor tyrosine kinases (RTKs)
- Signaling by enzymatic or enzyme-associated receptors
- Signaling by fosfolipid modifications
- Signaling by selective protein degradation
- Signaling by intracellular receptors
- Signaling by cytokines, hormones, growth factors
- Signaling by extracellular vesikels

PART III - Cell death

- Different types of cell death
- Cell death associated signaling cascades
- Cell death regulators
- Physiological versus pathological cell death

PART IV - Cell cycle, stem cells and cell differentiation

- Cell cycle and its positive and negative regulators
- Proto-oncogenes and tumor suppressor genes
- Stem cells
- Cell differentiation and cell migration

Initial competences

Good basic knowledge of cell biology, molecular biology, biochemistry, genetics and biotechnology (Programme of 2nd Bachelor of Science in Biochemistry and Biotechnology)

Final competences

- 1 Being familiar with the most important modern techniques to generate transgenic organisms.
- 2 Knowing the modern microscopic techniques and their applicability.
- 3 Obtaining knowledge on the cell cycle mechanisms with regulators.
- 4 Knowing the most important cellular signaling mechanisms.
- 5 Understanding the different mechanisms of cell death in the context of normal homeostasis and disease.
- 6 Understanding tumorigenic processes.
- 7 Understanding cell differentiation processes.
- 8 Obtaining knowledge on stem cell biology.
- 9 Being able to comprehend important cellular processes based on relevant literature.
- 10 Having acquired a solid basis for scientific research in life sciences.

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

Extra information on the teaching methods

This will be a combination of ex cathedra and interactive teaching, self-directed learning, and group tasks. The latter are part of Integrated Practical Exercises, and will allow focusing in depth on selected interesting cellular concepts.

Study material

Type: Syllabus

Name: Syllabus'

Indicative price: Free or paid by faculty

Optional: no

Additional information: An amply illustrated course can be downloaded from Ufora.Ugent.be free of charge. This digital course will be linked to Powerpoint slides and to URLs with relevant scientific articles (key and review articles) and interactive computer assisted simulations of (intra)cellular processes and experiments.

References

The purchase of at least one English textbook on Cell Biology (see below; preferentially Lodish et al., 2012, Molecular Cell Biology, 7th Ed.) is strongly advised.

* Lodish, H. e.a. (2012, 7th ed., hardback) - Molecular Cell Biology. Freeman and company, New York, ISBN 978-1-4292-3413-9.

* Alberts, B. e.a. (2014, 6th ed., hardback) - Molecular Biology of the Cell (with interactive CD-ROM). Garland Science, ISBN 978-0-8153-4432-2.

* Lewin, B. e.a. (2010, 2nd ed., hardback) - Cells. Jones & Bartlett Pub., Sudbury, ISBN 978-0763766641

* Weinberg, R.A. (2014, 2nd ed., paperback) - The biology of Cancer. Garland

Science, ISBN 978-0-8153-4220-5.

Course content-related study coaching

The student will be given the opportunity to ask questions to the lecturer either directly or indirectly through an electronic forum. Continued discussion will be stimulated. Group tasks with focus on various cellular concepts will further enhance the interaction between students and academic personnel.

Assessment moments

end-of-term assessment

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

Written assessment

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

Written assessment

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Evaluation will be based on a written examination with open questions, statements and multiple choice questions.

Calculation of the examination mark

Period-confined examination: 20 marks.