

Course Specifications

From the academic year 2016-2017 up to and including the

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

Credits 4.0 Study time 120 h Contact hrs 33.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	Dutch	lecture	25.0 h
		demonstration	8.75 h

Lecturers in academic year 2018-2019

Hoste, Esther	WE14	lecturer-in-charge
Goossens, Steven	WE14	co-lecturer

Offered in the following programmes in 2018-2019

	crdts	offering
Bachelor of Science in Biology	4	A
Preparatory Course Master of Science in Biology	4	A

Teaching languages

Dutch

Keywords

Microscopy, Transgenesis (introduction), Cell membranes, Cell wall, Nucleus, Organelles, Plastids, Vesicle transport, Cytoskeletons, Cell migration, Cell adhesion, Plasmodesmata, Extracellular matrix.

Position of the course

The aim of the course is to introduce biology students to the basic concepts of cell biology, the structure and function of the most common cell types and tissues, of both animals and plants. Furthermore, students will be introduced to state-of-the-art analytical methods in modern cell biology. This course comprises three main axes:

- Basic knowledge of contemporary technique for analysis of organisms at the cellular level: cell cultures, microscopy, transgenesis
- Structure and function of cell organelles, their functional relationships, and their integration in the general architecture of the cell. The course will shed light on the specific differences between differentiated cells and how these originate in animals as well in plants.
- Description of essential processes in cell biology including intracellular protein transport, cytoskeleton dynamics and cell-microenvironment interactions. In addition, the course focuses on specific cell adaptations differentiating plant cells from other eukaryotes. Special attention will be paid to the relationship between (ultra)-structure and function.

Contents

1 Principles of Cell Biology of Animals

- 1 Nucleus and nucleocytoplasmic transports: structure and function of the nucleus, introduction to intracellular transports, active transport through nuclear pores, the nuclear wall during mitosis
- 2 Organelles (incl. ultrastructure and intracellular transports): overview of organelles and research methods for intracellular transports, the endoplasmic reticulum (ER), the Golgi-apparatus, transport vesicles, endosomes, secretory vesicles, mechanisms of vesicle transports, lysosomes, mitochondria (and chloroplasts), peroxisomes or microbodies
- 3 Selection of techniques in cell biology: overview of microscopic and cytological techniques, cell cultures and stem cells (of vertebrates), generation of transgenic cells and animals
- 4 The Cytoskeleton (incl. cytoskeleton-associated proteins): functions and types of

- cytoskeletons, actin microfilaments, intermediate filaments (IF), microtubules (MT), actomyosin complexes
- 5 Cell-cell adhesion molecules and cell communication: intercellular junctions of the polarized epithelial cell, families of cell-cell adhesion molecules, inflammation as paradigm for the important role of cell-cell adhesion processes
- 6 Extracellular matrix (ECM) and cell-substrate interactions: role of ECM, typical elements of ECM (collagens, elastin, fibronectin, laminin, glycosaminoglycans, proteoglycans), cell-substrate adhesion molecules: integrines
- 2 Selection of important cell biological concepts
 - 1 Cell cycle and regulators in yeast and animals: cell cycle interphase, mitosis and meiosis, cell cycle control, model systems for cell cycle research, dynamics of anafase and cytokinesis
 - 2 Cell signaling in relation to cell division and cell death, principles of inter- and intracellular signaling, signaling by Receptor Tyrosine Kinases (RTKs), signaling via phospholipid modifications, cell death: apoptosis versus necrosis, mitogens versus Tumor suppressor genes.
 - 3 Cell migration and polarity upon differentiation: axon guidance

Initial competences

The student should have passed the program of the first Bachelor year, including general knowledge of biology, chemistry, physics and initiation in cell biology and genetics. The course will be integrated in the education package of the second Bachelor and will link up to the courses on (plant) Physiology, Biochemistry, Genetics and Molecular techniques (part I).

Final competences

- 1 The student is able to comprehend biological phenomena at the subcellular, cellular and tissue level.
- 2 The student is able to understand structure-function relationships and cellular processes in a cell biological and histological context.
- 3 The student is to explain the specific function of tissues by integration of the composing cell types in an optimally adapted tissue architecture.

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

Demonstration, lecture

Extra information on the teaching methods

Demonstrations of contemporary apparatus and procedures.

Learning materials and price

The amply illustrated course can also be downloaded from Minerva.Ugent.be free and obtained via GBK. The purchase of at least one English textbook on Cell Biology (see below) is recommended.

References

- Alberts, B. e.a. (2008, 5de ed., paperback) - Molecular Biology of the Cell (met interactieve CD-ROM). Garland Science, ISBN 978-0-8153-4106-2.
- Lewin, B. e.a. (2007, 1ste ed., harcover) - Cells. Jones & Bartlett Pub., Sudbury, ISBN 0763739057
- Lodish, H. e.a. (2008, 6de ed., hardcover) - Molecular Cell Biology. Freeman and company, New York, ISBN 978-0-7167-7601-7.
- Buchanan, B., Gruissem, W., Jones, R., eds. (2002) Biochemistry and Molecular Biology of Plants. John Wiley & Sons, Inc., New York, ISBN 0-943-08839-9.
- Cooper, G.M. & Hausman, R.E. (2004, 3de ed.) - The Cell: a Molecular Approach. ASM Press - Sinauer Associates, ISBN 0-87893-214-3.
- Junqueira LC, Carneiro J, Kelley RO, eds. Bewerkt door; Wisse E, Nieuwenhuis P, Ginsel L. (2004, 10de ed.) - Functionele Histologie. Elsevier Gezondheidszorg, ISBN 90-352-2671-2.

Course content-related study coaching

The student will be given the opportunity to ask questions to the lecturers either directly or indirectly through an electronic forum. Demonstration of microscopy and other cell biological techniques and equipment (2 afternoons) will be of great value to facilitate integration and comprehension of the theoretical part of the course.

Evaluation methods

end-of-term evaluation

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

Written examination with open questions

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

Written examination with open questions

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Calculation of the examination mark

Written exam: 100%