

CELL PHYSIOLOGY

(SVB0044-2017
48 hours, 6 ECTS)

2016-17



Master in **C**ellular
and **M**olecular **B**iology

University of Torino

Luca Munaron

Department of Life Sciences and Systems Biology
via Accademia Albertina 13, Torino, ITALY
phone: 0116704667
luca.munaron@unito.it
<http://lucamunaron.wixsite.com/lacm>



COURSE PRESENTATION

Learning outcomes
Syllabus, Summary & topics
Materials and resources
Learning assessments and exams

LEARNING OUTCOMES

KNOWLEDGE AND LEARNING SKILLS.

Theoretical and experimental approaches for the quantitative study of cell membranes and intracellular signaling.

USE OF KNOWLEDGE AND LEARNING SKILLS.

At the end of the course, the student is expected to be able to:

- use multiple experimental tools and results to solve a biological problem in cell physiology
- discuss the strength and limitations of the results published on a research paper
- communicate such findings using an appropriate language

SUMMARY AND TOPICS

Eukaryotic cell as a COMPLEX SYSTEM. Time, space, diffusion, energy. Basic thermodynamics.

DIFFUSION. Fick's Laws. Chemical & Physical constraints. Membrane permeation and transports. Classification and properties of membrane transporters. Translocation and vesicular trafficking.

Dynamic investigation of cell functions: EXPERIMENTAL APPROACHES in cell physiology and intracellular signaling.

Conventional and confocal fluorescence microscopy to study diffusible intracellular messengers (Ca²⁺, cAMP, NO...): fluorescent dyes and flash photolysis.

Protein tracking in living cells: Protein diffusion (FRAP). Protein-protein interaction and vesicle trafficking (FRET, TIRF, patch clamp)

CALCIUM HOMEOSTASIS AND SIGNALING. Calcium transporters, buffers, sensors and stores. Store-operated calcium entry.

SENSORY PHYSIOLOGY: membrane biosensors and ion channels. Electrical cable theory.

Electrotonic and action potentials. TRP channels. Piezo.

Photo- and mechanotransduction in Drosophila. Thermo- Mechano- and Chemo transduction in Vertebrates.

MATERIALS & RESOURCES for registered students:

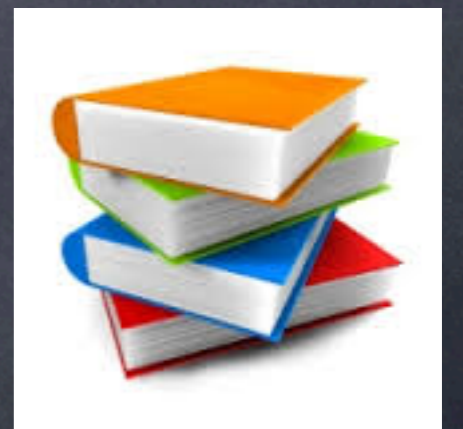
MOODLE

Lessons in PDF

Selected papers

Selected Websites

Textbooks (for some topics) available at DBIOS library



LEARNING ASSESSMENTS

Examinations will be based on material covered in lectures

- Midterm Multidisciplinary Test (MMT, optional)
- Multidisciplinary Research Essay (MRE, optional)
- Final exam
- Integrative interview (optional)



CellPhysiol Final exam specification

- Moodle-based test of 20-30 questions with different formats : open questions, multiple choice quizzes, true/false, short answers, open-ended questions; interpretation of experimental data and resolution of exercises
- The maximum grade will be 33/30.
- Any additional points obtained by MMT and MRE will be added to the final exam of the first exam session (January-February 2017).
- Final grading >30 will give rise to " 30 cum laude".