UCLouvain

lgbio1111

2020

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 15.0 h	Q2

Teacher(s)	De Smet Charles ;De Vleeschouwer Christophe ;Kienlen-Campard Pascal ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	This introduction to the molecular biology of the cell envisions cytology and physiology from an experimental point-of-view, to understand the structure and functions of animal cells. Nervous impulse transmission, muscular contraction, and cellular electrophysiology are considered to illustrate cell specialization and its impact on the cell structures and the functions that exist in living systems. Cellular processes that are of interest to the engineers will permit to introduce the sensors and devices used to observe and measure biological systems, including through microscopy.
Aims	With respect to the AA referring system defined for the Master in Biomedical Engineering, the course contributes to the development, mastery and assessment of the following skill : AA1.1, AA1.2, AA5.1 **At the end of this course, the student will be able to:** 1. Explain the functions that take place in the cells of a living organism; 2. Describe the structures/components of the cell and their respective role; 3. Understand the unicity hidden behind the diversity in terms of organization, shape, and function of living organisms; 4. Describe the basic concepts of conventional and molecular genetic; 5. Explain cellular processes (membrane transport, bio-signalisation, extra cellular communication, nervous impulse, muscular contraction) in terms of physico-chemical and molecular interactions between cell components; 6. Use basic methods to run cell biology experiments (cell material generation, activity measurement, interpretation); 7. Understand the cell visualization principles; 8. Enhance the images captured by microscopes; 9. Implement basic image processing operations (filtering, thresholding) to detect structures of interest in cell images. - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** A written exam evaluates individually the students on their understanding of the concepts and methods taught during the lecture. Hands-on training evaluation will be part of the final note.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Lectures, and tutorials including exercises on genetics and heredity, as well as an introduction to experimental techniques in molecular and cellular biology. The part devoted to microscopy will consist in 3 theoretical lectures presenting the acquisition devices (photon v. electron, fluorescence, confocal microscopy), the tools for image contrast enhancement (denoising, deconvolution), and some basic algorithms for cell images quantitative analysis.
Content	Cellular organisation • Cell molecules • Functional organisation, communication and division of cells • From gene to protein • Genetic polymorphisme and heredity Cellular and molecular mechanisms of specialized cell functions • Nervous influx and muscle contraction, in relation to physiological process • Introduction to experimental techniques based on specialized cell properties (electrophysiology)

	Introduction to cell imaging techniques: light and electron microscopes; Digital image processing: image deconvolution, cell components segmentation, and cell structure statistical analysis.
Inline resources	Moodle http://Moodle : http://moodleucl.uclouvain.be/course/view.php?id=9006
Bibliography	Un ouvrage de référence en Biologie sera recommandé aux étudiants Les supports et documents sont disponibles sur Moodle
Faculty or entity in charge	GBIO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Minor in Biomedical Engineering	LMINOGBIO	5		
Specialization track in Biomedical Engineering	FILGBIO	5		
Master [120] in Physics	PHYS2M	5		
Minor in Engineering Sciences : biomedical (only available for reenrolment)	MINGBIO	5		