LGBIO1111

2015-2016

Biologie et physiologie cellulaire

5.0 credits	30.0 h + 15.0 h	2q

Teacher(s) :	De Smet Charles ; Kienlen-Campard Pascal ; De Vleeschouwer Christophe ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	Moodle > http://Moodle : http://moodleucl.uclouvain.be/course/view.php?id=9006
Prerequisites :	None
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: -- Explain the functions that take place in the cells of a living organism; -- Describe the structures/components of the cell and their respective role; -- Understand the unicity hidden behind the diversity in terms of organization, shape, and function of living organisms; -- Describe the basic concepts of conventional and molecular genetic; -- 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; -- Use basic methods to run cell biology experiments (cell material generation, activity measurement, interpretation); -- Understand the cell visualization principles; -- Enhance the images captured by microscopes; -- 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 :	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 :	The course is organized around a series of lectures, including practical examples. The range of topics covered by the lecture being quite wide, it has been decided to focus on the methodology adopted to address a few specific problems related to each of the investigated topics. References will then be provided to reproduce those specific approaches to investigate other specific questions of the same problematic. Hands-on training aims at introducing the experimental methods used in cytology and physiology, so as to point out their limits and potential bias. 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.
Bibliography :	A cell biology reference book will be recommended Slides available on Moodle.
Faculty or entity in charge:	GBIO

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Minor in Engineering Sciences : biomedical	LGBIO100I	5	-	
Master [120] in Physics	PHYS2M	5	-	