

**UNIVERSITY OF PUERTO RICO  
SCHOOL OF MEDICINE**

**PHYSIOLOGY DEPARTMENT**

**COURSE DESCRIPTION**

COURSE TITLE: **CELLULAR AND MOLECULAR PHYSIOLOGY**

COURSE CODE: **FISA 8540**

CREDIT HOURS: **3 CREDITS (54 HOURS)**

COURSE DURATION: **18 WEEKS**

NUMBER OF STUDENTS: **MIN: 4      MAX: 16**

COORDINATOR NAME: **CARLOS A. TORRES-RAMOS, PH.D.**

COORDINATOR OFFICE HOURS: **TO BE ARRANGED**

COORDINATOR OFFICE: **A-644**

COURSE HOURS: **SEE ATTACHED SCHEDULE (1.5 hrs. twice/week)**

WHEN WILL BE OFFERED:             QUARTERLY        **X**   SEMESTER (S2)  
     **X**   YEAR (1<sup>ST</sup>)             SUMMER

PREREQUISITE: **NONE**

JUSTIFICATION:    The graduate program in Physiology provides the opportunity for students to obtain knowledge in the different systems that traditionally have been considered to belong to the field of physiology (i.e. cardiovascular system, renal system, nervous system, etc.). However, it is important for students to understand basic cellular and molecular biology in order to integrate recent discoveries made in the different areas of Physiology using molecular genetic approaches. Therefore, there is a need for a course in which the principles of cellular and molecular biology are taught in the context of modern physiology. This course is available for students from other departments of the Medical Sciences Campus and from other units of the University of Puerto Rico with the appropriate authorization from the course coordinator.

**DESCRIPTION:** Basic principles of cellular and molecular biology will be presented within the conceptual frame of modern physiology. Three main areas will be presented: 1) Physiological Genomics (gene structure and chromatin organization, DNA repair, regulation of gene expression, RNA splicing, and RNA translation); 2) Cellular Physiology (intracellular compartments, protein sorting, vesicular trafficking, cytoskeleton); 3) Mitochondrial Physiology (mitochondrial genetics, protein import, respiration and apoptosis); 4) Physiology of Aging (model organisms, molecular genetics of aging in higher eukaryotes). A strong emphasis will be given to the understanding of the different experimental approaches and techniques available for studying problems in the above-mentioned areas. Also, students will develop skills in the critical analysis of scientific literature.

**COURSE OBJECTIVES:**

- 1) Describe how the gene, chromatin and chromosome structure play an important role in the storage and expression of the genetic information.
- 2) Mention the main types of DNA lesions, how they promote mutagenesis and the different DNA repair mechanisms available for the repair of such lesions.
- 3) Describe the role that gene regulatory sequences have in the regulation of gene expression.
- 4) Describe post-transcriptional and translational events that can regulate the flow of genetic information.
- 5) Mention epigenetic factors that regulate the phenotypic expression of a cell, tissue or organism.
- 6) Mention post-translational modifications required for intracellular protein sorting.
- 7) Describe the most important components of intracellular vesicular transport.
- 8) Describe how cells utilize different intracellular second messengers to achieve normal physiological processes.
- 9) Describe the role of mitochondria in physiological processes and during apoptosis.
- 10) Mention the component of the cytoskeleton and how they are required for the physiological processes such as cell division and motility.
- 11) Describe how adjacent cells communicate among themselves and how they interact with the extracellular matrix.
- 12) Describe the molecular basis of aging in model organisms and in humans.

TEACHING STRATEGIES:

METHODS:

**Conferences**  
**Group Discussions**  
**Assigned Readings**

AUDIOVISUAL RESOURCES:

**Blackboard**  
**PowerPoint Slides**  
**Webcasts**

ESSENTIAL REQUIREMENT:

**Attendance and punctuality**

EVALUATION STRATEGIES:

<b>Category</b>	<b>Value (%)</b>
Exam I	30 %
Exam II	30 %
Exam III	25 %
Written critiques	10 %
Class participation	5 %
Total	100 %

GRADING SCALE:

<b>Average (%)</b>	<b>Grade</b>
100-88	A
87-78	B
77-70	C
≤69	F

BIBLIOGRAPHY:

Textbooks:

1) Molecular Biology of The Cell (5th edition, Alberts et al. 2008, Garland Science, New York)

Scientific Journals:

Science  
Nature  
Proceeding of the National Academy of Sciences USA  
Journal of Biological Chemistry  
Cell  
Molecular and Cellular Biology  
Molecular Biology of the Cell

Nucleic Acid Research  
EMBO Journal

Websites:

[www.pubmed.gov](http://www.pubmed.gov)  
[www.cellbio.com](http://www.cellbio.com)

#### REASONABLE ACCOMODATION STATEMENT:

**Students with a health condition or situation that, according to the law, makes them eligible for reasonable accommodation have the right to submit a written application to the professor and the Dean of their Faculty, according to the procedure established in the document Submittal Process for Reasonable Accommodation of the Medical Sciences Campus. A free copy of this document may be obtained at the Office of the Dean for student Affairs, second floor of the School of Pharmacy building; phone 787-758-2525 ext. 5203. A copy may also be obtained at the Office of the Dean of each faculty, as well as in the MSC web page. The application does not exempt students from complying with the academic requirements pertaining to the programs of the Medical Sciences Campus.**

#### ACADEMIC INTEGRITY

**The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Student Bylaws (Certification JS 13 2009–2010) states that "academic dishonesty includes but is not limited to: fraudulent actions, obtaining grades or academic degrees using false or fraudulent simulations, copying totally or partially academic work from another person, plagiarizing totally or partially the work of another person, copying totally or partially responses from another person to examination questions, making another person to take any test, oral or written examination on his/hers behalf, as well as assisting or facilitating any person to incur in the aforementioned conduct". Fraudulent conduct refers to "behavior with the intent to defraud, including but not limited to, malicious alteration or falsification of grades, records, identification cards or other official documents of the UPR or any other institution." Any of these actions shall be subject to disciplinary sanctions in accordance with the disciplinary procedure, as stated in the existing UPR Student Bylaws.**

*DISCLAIMER: The above statement is an English translation, prepared at the Deanship of Academic Affairs of the Medical Sciences Campus, of certain parts of Article 6.2 of the UPR Student Bylaws "Reglamento General de Estudiantes de la Universidad de Puerto Rico", (Certificación JS 13 2009-2010). It is in no way intended to be a legal substitute for the original document, written in Spanish.*