UNIVERSITY OF PUERTO RICO
MEDICAL SCIENCES CAMPUS
SCHOOL OF MEDICINE

DEPARTMENT OF PHYSIOLOGY

COURSE DESCRIPTION

COURSE TITLE:	INSTRUMENTATION AND METHODOLOGIES USED IN BIOMEDICAL RESEARCH
COURSE CODE:	FISA 8532
CREDIT HOURS:	3 CREDITS (54 HOURS TOTAL)
COURSE DURATION:	18 WEEKS
NUMBER OF STUDENTS:	NO MORE THAN 10 STUDENTS AND NO LESS THAN 4
COORDINATOR NAME:	SABZALI JAVADOV, M.D., PH.D.
COORDINATOR OFFICE HOURS:	BY APPOINTMENT
COORDINATOR OFFICE:	A-674
COURSE HOURS:	TUESDAY AND WEDNESDAY FROM 1-3 P.M.
WHEN WILL BE OFFERED:	ONE SEMESTER
PREREQUISITE:	GENETICS, ORGANIC CHEMISTRY, AND CALCULUS

COURSE DESCRIPTION

The course is designed to provide a basic working knowledge of physiological, biophysical, biochemical, and molecular techniques used in biomedical research. The overall goal is to provide students with an understanding of methodical approaches that can be used in animals- and cell-based studies as well as in the evaluation of human tissues. The course begins with a discussion of basic principles of electricity, circuits and signal recording and transducers. The course then addresses main principles of molecular biology techniques for protein and gene analysis in cell/tissue samples followed by an in-depth introduction to confocal microscopy, patch-clamp techniques, proteomics analysis, and fluorescence-activated cell sorting (FACS). The course consists of lectures, hands-on laboratory sessions and demonstrations.

COURSE OBJECTIVES AND EXPECTED OUTCOMES

The overall objective of this course is to:

- acquire a basic knowledge of electrical dc and ac circuits
- learn the theory and use of the oscilloscope, volt-ohm meter, pH meter, spectrophotometer, and the atomic absorption spectrometer
- learn the theory and use of stimulator, recording apparatus and electronic transducers
- learn the main principles of gene expression by RT-PCR, RNA sequence and microRNAs analysis
- learn the basic principles of DNA damage analysis
- learn the main principles of protein expression analysis by SDS PAGE and Western blotting technique
- acquire a basic knowledge of proteomics analysis
- learn basic principles of the patch-clamp technique
- acquire a basic knowledge of confocal microscopy
- learn main principles of fluorescence-activated cell sorting (FACS)

By the end of the course the students will be able to:

- classify, and understand main principles/application of basic electronic measuring instruments, power supplies, amplifiers electronic transducers, and physiological stimulators and recorders used in biomedical research
- design simple analog circuits used in bioinstrumentation
- adjust and work with the methods for analysis of protein and gene expression in cell lysates and tissue samples
- understand basic principles/application of confocal microscopy, proteomics analysis, patch-clamp technique and FACS for biomedical research.

COURSE TOPICS AND TIME DISTRIBUTION

I	Basic electronics, and AC/DC circuits	2hrs	Dr. Santacana
II	Basic electronic measuring instruments, power supplies and amplifiers	2hrs	Dr. Santacana
III	Electronic transducers, physiological stimulators and recorders	2hrs	Dr. Santacana
IV	pH measurement, spectrophotometry and atomic absorption spectrometry	2hrs	Dr. Santacana
V	**Exam I**		Dr. Santacana
VI	DNA damage analysis	2hrs	Dr. Torres
VII	Gene expression analysis by RT-PCR	2hrs	Dr. Miranda
VIII	Protein analysis by SDS-PAGE and western blotting; immunoprecipitation	2hrs	Dr. Javadov
IX	Protein expression analysis by immunochemistry	2hrs	Dr. Segarra
X	**Exam II**		Dr. Javadov
XI	Proteomics analysis	4hrs	Dr. Melendez
XII	Microarrays and RNA sequence analysis	4hrs	Dr. Cadilla
XIII	Patch-clamp technique	2hrs	Dr. Jimenez
XIV	Confocal microscopy	2hrs	Dr. Sanabria
XV	Microfluorimetry of intracellular calcium	2hrs	Dr. Sanabria
XVI	Fluorescence-activated cell sorting (FACS)	2hrs	Dr. Gerena
XVII	microRNAs	2hrs	Dr. Vivas
XYII	**Exam III**		Dr. Javadov

PARTICIPATING FACULTY

FACULTY	*OFFICE/CAMPUS*	*TEL/EMAIL*
Carmen Cadilla	Dept Biochem/MSC	(787)754-4366 /carmen.cadilla@upr.edu
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Pablo Vivas	Cancer Center/MSC	(787) 772 8300 x1114/pablo.vivas@upr.edu

TEACHING STRATEGIES

The course is based on a two hour lecture and two hour lab practice format.

ESSENTIAL REQUIREMENTS

Attendance and punctuality. Parts of this course (Confocal Microscopy Techniques) will take place at Universidad Central de Caribe at Bayamon. The students at the Medical Sciences Campus should plan in advance the transportation arrangements for these days with Dr. Javadov.

EVALUATION STRATEGIES

The students will be evaluated using three practical and/or written exams (90% of the grade) and subjectively through student participation (10% of the grade) in the different experiences covered.

EVALUATION SYSTEM

Grades will be administered as follows:

A: 99-90%
B: 89-80%
C: 79-70%
F: >69%

BIBLIOGRAPHY

Due to the nature of this course, the description of the methods/techniques and/or manuals for equipments to be discussed will be provided by each professor in each section of the course.

REASANOBLE 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.