

EASTERN MEDITERRANEAN UNIVERSITY
DEPARTMENT OF PHYSICS

COURSE CODE	PHYS119	COURSE LEVEL	First year
COURSE TITLE	Biophysics	COURSE TYPE	FACULTY CORE
CREDIT VALUE	(4, 1) 4	ECTS VALUE	6 credits
PREREQUISITES	None	COREQUISITES	Basic Mathematics
DURATION OF COURSE	One semester	SEMESTER and YEAR	Spring 2019-2020

INSTRUCRORS	OFFICE
Prof. Dr. S. Habib Mazharimousavi habib.mazhari@emu.edu.tr	AS 239
ASSISTANCE	M. Izadparast

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CATALOGUE DESCRIPTION

Basic mechanisms of tools used in professional practice and research, voltage, current, basic electrical circuits, transducers, basic signals, filters, amplifiers, sampling, problem solving, radioactivity and medical imaging principles, electromagnetic waves, radioactivity, radioactive elements and radioactive fragmentation, effect of radioactivity on substances, radioactivity units, effect of radioactivity on organism, X-ray imaging, computed tomography, Nuclear medicine. Magnetic Resonance Imaging MRI, Basic principles of dental biomechanics, Electrophoresis, Use of laser in medicine, Diffusion event, diffusion in membranes. Cell membrane transport, ionic equilibrium and Nerst equation, Goldman-Hodgkin-Katz equation, membrane permeability, resting membrane potential, active Na-K pump, ligand-dependent ion channels, secondary messengers, receptors and binding reactions in cell membranes, cell biophysical events in cell membrane: General characteristics of cell membrane, Mechanism of action potential formation, Nerve-muscle junction and electrical equivalent circuits.

AIMS & OBJECTIVES

- To introduce the fundamental concepts of biophysical systems.
- To provide students with a deeper understanding of fundamental laws of natural phenomena applicable in biological systems.
- To improve students' problem solving skills.
- To strengthen students' creative and systematic thinking capability.

GENERAL LEARNING OUTCOMES (COMPETENCES)

On successful completion of this course, all students will have developed **knowledge and understanding** of:

- The concepts, theories, techniques and generalizing principles of classical mechanics, electricity and magnetism;
- The mathematical forms of the laws and physical relationships and their application in solving problems;
- Diagrammatic and graphical representation of physics problems and physical data;
- Validation of theory through experiment/observation.

On successful completion of this course, all students will have developed **their skills in**:

- Correctly using symbols and units;
- Analytically/critically applying the theoretical concepts and methods covered in the course, and formulating appropriate equations to solve problems;
- Using efficiently and effectively the textbook and other printed/electronic literature relevant to the course;
- Using good scientific English for written and oral communication.

On successful completion of this course, all students will have developed their **appreciation** of, and respect for **values and attitudes** to:

- The discipline of physics as a fundamental branch of science that provides qualitative and quantitative explanations about the physical world;
- Being an open-minded, curious, creative and reasoned skeptic;
- Being aware of ethical issues in science.

GRADING CRITERIA

A (excellent) ~85% and above	Excellent understanding of the concepts and the principles as demonstrated by correct and accurate knowledge and application of theory/laws in solving problems. Response to problems is clear, legible, concise and accurate. Excellent performance.
B (good) ~70% and above	Better than average understanding of the concepts and the principles as demonstrated by correct and accurate knowledge and application of theory/laws in solving problems, but doesn't have the depth and outstanding quality of an "A". Response to problems is fairly clear, legible, but occasionally contains some inaccuracies. Performance exceeds the minimum requirements
C (average) ~60 % and above	An average understanding of the concepts and the principles as demonstrated by reasonably correct knowledge and application of theory/laws in solving problems, but doesn't have any depth. Response to problems is reasonably clear, legible, but contains inaccuracies. It reveals a sufficient understanding of the material, but lacks depth in understanding and approach/application. Content and form don't go beyond basic expectations and/or display some substantial errors. Acceptable but non-exceptional performance that doesn't go beyond the minimum requirements.
D (barely sufficient) ~50% and above	Minimal knowledge and barely sufficient understanding of the concepts and the principles as demonstrated by approximately correct application of theory/laws in solving problems. Response to problems is not very clear and is barely legible, and contains many inaccuracies. It reveals a minimum (confused) understanding of the material, and lacks depth in understanding and approach/application. Content and form do not adequately meet the basic expectations, and/or display significant errors. Performance demonstrates severe problems in one or more areas.
F (fail) Below 50%	Work does not meet the most minimal standards. It reveals no understanding of the material, lack of basic academic skills and knowledge, or completely incomprehensible writing. Performance is not acceptable
NG nil grade	Not enough information to assign a letter grade.

METHOD OF ASSESSMENT

Midterm #1Exam	25 points (EXACT DATE WILL BE ANNOUNCED BY THE RECTOR'S OFFICE VIA YOUR STUDENT PORTAL)
Midterm #2Exam	20 points (EXACT DATE WILL BE ANNOUNCED BY THE PHYSICS DEPARTMENT)
Lab Attendances	5 points (5 experiments; each one is 1 point)
Lab Examination	10 points (EXACT DATE WILL BE ANNOUNCED BY THE PHYSICS DEPARTMENT)
Final Exam	40 points (EXACT DATE WILL BE ANNOUNCED BY THE RECTOR'S OFFICE VIA YOUR STUDENT PORTAL)

IMPORTANT NOTES Attendance to lectures:

Active participation to lectures is a must for successful completion of this course. *If the student's attendance is below 50% automatically the grade NG will be assigned.*

Make-up Exam:

Students having not attended the Midterm Exams or Final Exam are entitled to enter the Makeup Exam to be held after the Final Exam period (time and place will be announced).

Objections:

Graded exam papers will be available for inspection upon request. According to the regulations of the University, any objections or re-grade requests should be made within a week of the announcement of grades.

TEXTBOOK (REQUIRED)

Medical Biophysics (Damjanovich S, Fidy J, Szöllösi J editors) Medicina Press, 2009

Biological Physics: Energy, Information, Life (Philip Nelson) WH Freeman; Updated 1st edition edition (2007)

COURSE SCHEDULE

Lectures	Subject
1	Foundations of quantum physics
2	Structure of the atom
3	Quantum numbers
4	Electromagnetic spectrum. Light
5	The laser
6	X-rays
7	Foundations of thermodynamics
8	Thermodynamic potentials
9	Structure of the atomic nucleus. Radioactivity
10	Interaction of radioactive radiation with matter
11	Biological effect of radioactive radiations
12	Diffusion
13	Osmosis
14	Osmosis
15	Biophysics of water
16	Fluid flow
17	Biophysics of circulation. Cardiac biophysics
18	Structure of macromolecules
18	Protein structure and folding
20	Membrane structure. Resting membrane potential
21	Sensory receptors. Action potential
22	Vision
23	Hearing
24	The cytoskeletal system
24	Motor proteins. Cellular motility
26	Structure and mechanics of cross-striated muscle
27	Molecular basis of muscle function and regulation
	Finals

ACADEMIC HONESTY - PLAGIARISM

Cheating is copying from others or providing information, written or oral, to others. Plagiarism is copying without acknowledgement from other people's work. According to university by laws cheating and plagiarism are serious offences punishable with disciplinary action ranging from simple failure from the exam or project, to more serious action (letter of official warning suspension from the university for up to one semester). Disciplinary action is written in student records and may appear in student transcripts.

IMPORTANT NOTICE TO ALL STUDENTS REPEATING THE COURSE FOR A BETTER GRADE; WHATEVER GRADE YOU RECEIVE AT THE END OF THIS SEMSTER WILL REPLACE YOUR PREVIOUS GRADE.