

Course Plan

Semester: First semester	Academic Year :2025 (1404-1405)
Level: MSc	Major: Medical Physics
Course Title: Electricity, magnetism and its application in medicine	Department: Medical physics
Course Code: 1345887	University Professor or Faculty member:Dr.Mahsa Mansourian
Class NO:2	Credit Hours: 8-10
Prerequisite: -	Credit Units: 1 theo (.....Theo and Prac)
Availability of Professor: Mondays (10-1)	Tel:+98319729228
Office Address: Southwestern Medical School, First Floor, Department of Medical Physics	E-mail: mansourian@med.mui.ac.ir
Name of Student Representative and Cellphone Number:	Number of Students :7
<p>The General Purpose of the Lesson: Introduction to the basics of bioelectromagnetism, the electrical properties of tissues, the origin of biopotentials and electric and magnetic fields, and their application in diagnosis, treatment, and biomedical research.</p>	

Learning Outcomes (Objectives):

- Describe the origin of vital potentials and the factors affecting them.
- Describe the model and electrical field of the heart and how to analyze it.
- Describe the brain's electrical fields, their origin, and how EEG is recorded and distributed.
- Describe the origin of electromyography, the characteristics of the muscle signal, and the characteristics of EMG.
- Describe the origin and characteristics of the ERG wave and how it is recorded and analyzed.
- Describe methods for measuring the intrinsic electrical properties of biological tissues.

Assessment Methods:

(The Assessment Methods that will be Used to Test Students Learning outcomes & the Skills & Competencies Stated in learning Outcomes)

Assessment	Score From 20
Mid Exam (Theory)	-
Final Exam	17
Practical Exam	-
Assignments:	3
Total Marks	20

Main References (Text Books):**References for More Reading:**

1. Hobbie Russell K. "Intermediate Physics for Medicine and Biology". John Wiley and Sons Inc. Latest edition
2. Misulis Karl E. "Essentials of Clinical Neurophysiology". 2nd edition. Butterworth-Heinemann..Latest edition
3. Malmivno Jakko, Plonsey Robert. "Bioelectromagnetism: Principles and Application of Bioelectric and Biomagnetic Fields". Oxford University Press. Oxford. Latest edition

Student's Responsibilities:

Students are expected to be familiar with the topic of each session and prepared for group discussions.

Students must have thoroughly reviewed the provided lecture files and reading materials.

All assignments must be completed and uploaded by the specified deadlines.

Regular, punctual, and active participation in all sessions is mandatory.

Attendance Rules:

Regular attendance is essential for success in this course. Students are expected to attend all sessions. Missing more than 1 sessions may result in a grade reduction or disqualification from the final exam, in accordance with university regulations. If a student is absent due to unavoidable circumstances, documentation must be provided.

Department's Attitudes:

We expect all students to approach their studies with curiosity, adhere to ethical research standards, and engage respectfully with peers and faculty. We value collaborative learning and the pursuit of evidence-based knowledge.

Mid Exam Date: -**Final Exam Date:** 2026/01/14

NO of Session	Main Topic	Teacher's Name	Place & Time	Date	Method of Presentation
1	Membrane potential, Action potentials, and basic circuit models of cells.	Dr. Mansourian	Class number 2	2025/9/25	Interactive Lecture
2	Cardiac dipole model, electrical field of the heart, and ECG signal analysis.	Dr. Mansourian	Class number 2	2025/10/2	Problem-Based Learning, Group Discussion
3	Source of brain electrical fields and the physiology of neurons as signal generators.	Dr. Mansourian	Class number 2	2025/10/9	Interactive Lecture

4	Origins of EEG, electrode placement (10-20 system), and signal distribution.	Dr. Mansourian	Class number 2	2025/10/16	Interactive Lecture, Problem-Based Learning
5	Motor units, physiology of muscle contraction, and electrical characteristics of EMG signals.	Dr. Mansourian	Class number 2	2025/10/23	Interactive Lecture
6	EMG recording techniques, signal processing, and clinical interpretation.	Dr. Mansourian	Class number 2	2025/10/30	Interactive Lecture, Problem-Based Learning
7	Origin of retinal signals, wave components (a-wave, b-wave), and recording/analysis methods.	Dr. Mansourian	Class number 2	2025/11/6	Interactive Lecture
8	Methods for measuring intrinsic electrical properties (Impedance, Conductivity) of biological tissues.	Dr. Mansourian	Class number 2	2025/11/13	Interactive Lecture