Name of the module: General Physiology and Electrophysioloy

Number of module: 471-8-2026

BGU Credits: 5

ECTS credits:

Academic year: 2nd year Medicine

Semester: first semester

Hours of instruction: Mon 13:15-15:00, Wed 13:15-16:00, Thu 10:15-12:00
Total teaching time: Lectures 60 hours, exercises 30 hours

Location of instruction:
Specific classroom numbers are assigned yearly.

Language of instruction: Lectures will be given in Hebrew.

Cycle: B. Med.Sc.

Position: Obligatory for 2nd year preclinical medical students

Field of Education: Physiology

Responsible department: Physiology and Cell Biology

General prerequisites: Physics A/B, Biochemistry A, Cell Biology, Chemistry, Basic math

Grading scale: 65-100 (<65 Failed)

Module Description: Provides the students with basic knowledge of the principles of biophysics and cellular physiology, and cell biology of the neuron.

Aims of the module: The module invokes quantitative understanding of the principles of cellular biophysics as they occur in excitable physiological systems (brain, heart, secretory cells and musculature)

Objectives of the module: Each student will (1) develop a conceptual understanding of the basic principles of biophysics; (2) understand how excitable cells work in isolation and in ensembles; (3) understand how these principles apply to the physiological and pathological function of excitable tissue and (4) develop a flexible, logical problem solving methodology applicable, not only to this course, but to the greater academic and career challenges ahead.

Learning outcomes of the module: On successful completion of the course, the student should be able to:

1. Develop basic understanding of biophysicsical concepts,
2. Develop problem-solving and critical-thinking skills,
3. Learn to integrate and apply key concepts of biophysics as they occur in the many different relevant cell types.
4. Understand the special properties of excitable tissue

Attendance regulation: Attendance to the lectures is not obligatory, attendance to and submission of the frontal exercises and computer exercises is obligatory.

Teaching arrangement and method of instruction: Instruction in the course is based on frontal oral lectures, frontal exercises by teaching assistants, computer exercises, written assignments and and two mid-term quizes.

Lecturers: Daniel Gitler, Hava Golan, Ilya Fledervish, Adrian Israelson

Contact details:
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Office hours: By appointment

Module evaluation: at the end of the semester the students and the lecturers will evaluate the course.

Confirmation: the syllabus was confirmed by the faculty academic advisory committee to be valid on 2015 (academic year)

Last update: 9/2015

Assessment:
Students will be assessed in the module by a final exam with a mandatory score of 65 or higher, consisting of 90% of final grade, two mid-term tests, each consisting of 5% of final grade. Extra credit is based on participation in exercise sessions and submission of written assignments.

Work and assignments: Solving exercises, both written and computerized, and reading the relevant text book chapters (before lecture as a preparation, and after it as a review).

Time required for individual work: In addition to attendance in class (60h) and exercises (30h), the students are expected to hand in written assignments, review the lectures and read the relevant book chapters. This course requires substantial work by the students after the lectures to process the learnt material and to generalize the concepts that were taught. Approximately 30-60 additional minutes are necessary per lecture (30 lectures). Eight exercises require each approximately 1 hour to solve. Total: 113-128h.

Course Content\ schedule and outlines:

- Physiological control systems and homeostasis
- Molecular transport in cells
- Movement of particles in solution
- Electrical properties of membranes and cells
- Passive properties of the cell membrane
- Channels, voltage dependence of channels
- The action potential
- Electrical properties of synaptic contacts between neurons, integration
- The quantal model of synaptic function
- The molecular basis of synaptic function
- Secretory cells and their regulation
- Local semi-autonomous function of the synapse and the vesicle cycle
- Postsynaptic properties, agonists and antagonists
- Synaptic plasticity
- The glial cell and its functions
- Clinical aspects of neurophysiology and neurodegenerative illness
- The heart action potential
- The electrocardiogram and arythmias
- Electrico-mechanical coupling in muscles: heart, striated and smooth muscle
- Futurism in neuroscientific research

Textbooks:

From neuron to brain, 5th Edition, John Nicholls, Robert Martin, Paul Fuchs, David Brown, Mathew Diamond, David Weisblat (Sinauer), Chapters 1, 4-13, 16

Additional reading material:

Principles of Neural Science, 5th Edition, Eric Kandel, James Schwartz, Thomas Jessell, Steven Siegelbaum, A. J. Hudspeth (McGraw Hill), Chapters 2, 4-12 (extra 13-14).

Specific pages (in 5th edition):

189-199

205-208

210-217

220-225

227-234

Chapter 11 in a most general fashion

260-287

There are parts of the course that do not appear in the book.