**Name of the module:** Neurophysiology  
**Number of module:** 471.8.2027

<table>
<thead>
<tr>
<th>BGU Credits:</th>
<th>2</th>
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<tbody>
<tr>
<td>ECTS credits:</td>
<td></td>
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<tr>
<td>Academic year:</td>
<td>2nd year medicine.</td>
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<td>Semester:</td>
<td>spring semester.</td>
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<tr>
<td>Hours of instruction:</td>
<td>8am – 10am.</td>
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<td>Location of instruction:</td>
<td>TBA</td>
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<td>Language of instruction:</td>
<td>Hebrew</td>
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<td>Position:</td>
<td>Obligatory module intended for 2nd year medical students, as part of their preclinical teaching.</td>
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<tr>
<td>Field of Education:</td>
<td>Physiology.</td>
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<td>Responsible department:</td>
<td>Physiology and Cell Biology.</td>
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<td>General prerequisites:</td>
<td>Students should complete successfully the preceding course in cellular physiology. Basic knowledge in physics, cellular biology and medical biochemistry is assumed.</td>
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**Grading scale:** from 0 to 100.  
30% - active participation in classes.  
70% - final exam.  

Students should pass the final exam with a grade of 65 and above.

**Course Description:** The course explores various mechanisms in the nervous system. It deals with the operation of some of the sensory systems, from the sensory transduction to the network mechanisms of sensory processing. Other topics will include motor planning and execution, sleep and synchronization.

**Aims of the module:** Introduce basic principles in the operation of the CNS. Emphasis is placed on the many open questions, and current research directions.  
**Objectives of the module:** Develop knowledge in brain mechanisms, ability to read research papers, and sufficient curiosity required to promote additional reading and future follow-up of the topic.  
**Learning outcomes of the module:** On successful completion of the course, the student should be able to:

1. Demonstrate knowledge of the sensory organs and sensory transduction mechanisms.
2. Demonstrate basic understanding of neuronal network operations behind sensory processing.
3. Show knowledge of the mechanisms behind motor planning and execution.
4. Read current articles.
5. Understand basic deficits in neurological disease.

**Attendance regulation:** Obligatory in discussion groups.

**Teaching arrangement and method of instruction:** The course is based on 'flipped classroom' method. The class will be divided into 4 groups, and each group will discuss a topic with one of 2 lecturers every other week.
Assessment:

1. Multiple-choice examination. – 70%
2. Active participation in discussion groups – 30%

Work and assignments: NA

Time required for individual work: in addition to attendance in class, the students are expected to do their assignment and individual work:

Students are expected to study and prepare for discussion. Reading materials include textbook, presentations and various web sites. They are expected to spend 4 hours / week studying for this course.
Module Content schedule and outlines:

Lecture 1: Introduction of the structure of the CNS: cellular constituents, gray and white matter, major subdivisions of the CNS, modulatory nuclei, structure of the neocortex.

Lecture 2: Sensory transduction 1 – the chemical senses: the receptor cells, transduction mechanisms, coding strategies in the sensory organ - population code vs. labeled lines, the unique properties of the olfactory system.

Lecture 3: Sensory transduction 2 – the eye: the anatomy of the eye, mechanisms of the transduction, cellular components of the retina, and receptive fields in the retina.

Lecture 4: Sensory transduction 3 – mechano receptors: the anatomy of the inner ear, transduction of sound in hair cells, amplification mechanisms, acoustic trauma. The vestibular organ and the sense balance and head position.

Lecture 5: the somatosensory system 1: the different senses, properties of receptors in the skin, peripheral sensory axons, somatotopic organization.

Lecture 6: the somatosensory system 2: somatosensory representation in the neocortex, symptoms of damage to the posterior parietal lobe. The unique properties of the sense of Pain.

Lecture 7: spinal control of movement: the motor unit and the NMJ, spinal cord organization, reflexes.


Lecture 9: the visual system 1: dark and light adaptation, retinal processing, ganaglion cells receptive fields, the LGN.


Lecture 11: the hippocampus: anatomy, role in memory systems, place cells.


Lecture 13: brain mechanisms of emotion: theories of emotion, the limbic system, the amygdala and fear, difficulties with the single emotion system concept.

Lecture 14: Discussion of a recent article.

Required reading:

Relevant chapters from either:


Additional literature:


* All learning material will be available to the students on the module's website (high-learn)/ library/ electronic documents available to BGU students.