26/1/2023

Spring Semester 21/3/2023-6/7/2023

Course number: 336536

Course name in English: Neural Recording and Stimulation Methods

שם הקורס בעברית: שיטות במדעי העצב

Teaching staff

Lecturer

Name: Limor Freifeld

Email: freifeld@bm.technion.ac.il

Office hour days and times: By appointment

Tutor

Name: TBD

Email: TBD

Office hour days and times: TBD

Syllabus and details

In this class we will review cutting-edge technologies in use today in neuroscience research. We will familiarize ourselves with the challenges faced by engineers who develop such technologies, the approaches currently applied for mitigating these challenges and the existing gaps between what is desired and what is already available in this field. Via a project, we will obtain experience in planning and testing the feasibility of a solution for the challenge of measuring neural activity to address an outstanding question in neuroscience.

By the end of the semester, students will:

- Understand the engineering challenges in developing research methods in the neuroscience field.
- Be familiar with existing methods of research in the neuroscience field, their advantages and disadvantages.
- Know what are the needs that must be met via future developments in this area.

Credit points: 2.5

Teaching language: English

Prerequisites:

Biophysics and Neurophysiology for engineering – 336537 Or
Neuroscience - 274325

Instruction methods

Lectures and tutorials in this class will be primarily frontal. Nevertheless, remote participation will be allowed via the broadcast of lectures and tutorials on zoom as well as the upload of recordings to the class' website on moodle.

Lectures – days and times: Thursdays, 10:30-12:30. Location: TBD

Tutorials – days and times: Thursdays, 13:30-14:30. Location: TBD

Evaluation methods

Grades in this class will be determined according to a final project that will be submitted in the last week of the semester. Home-work exercises will consist of project mile-stones that must be met during the semester to allow the successful completion of the final project and timely submission of the final project report.

Grade composition:

Grade of each HW exercise: 10% valid (3 exercises total – 30% of the grade)

Grade of the final project: 70% valid, out of which 10% is the presentation grade and 60% is the grade for the final report.

Class Schedule

Lecture topics by semester weeks from 21.03.202 to 06.07.23

Week	Date	Lecturer	Lecture topic
1	23.03.2023	Limor Freifeld	Introduction, Neural activity modeling
2	30.3.2023	Limor Freifeld	Neural activity modeling – cont.; Behavior, questions and models in neuroscience
3	20.04.2023	Limor Freifeld	Behavior, questions and models in neuroscience
4	24.04.2023	Shay Stern	Behavior, neuromodulation and individuality
5	04.05.2023	Limor Freifeld	Electrophysiological measurements and their analysis
6	11.05.2023	Limor Freifeld	Neural activity imaging – indicators
7	21.05.2023	Limor Freifeld	Neural activity imaging – microscopy, data analysis
8	01.06.2023	Ben Engelhard	Applications of virtual reality
9	08.06.2023	Dori Derdikman	Methods for simultaneous activity measurement of hundreds of cells in behaving mice
10	15.06.2023	Omri Barak	Neural signal analysis
11	22.06.2023	Limor Freifeld	Methods for manipulation of neural activity – Optogenetics
12	29.06.2023	Shai Berlin	Latest advances in optogenetics
13	06.07.2023	Students	Student presentations

Faculty of Biomedical Engineering