Overview

•BE 571/BE771: Introduction to Neuroengineering

• Instructor: Prof. Xue Han, Office: CILSE 805B, xuehan@bu.edu

• Teaching Fellow: Jack Sherman, jsherm1@bu.edu

• Lecture: MW 10:10-11:55, PHO 210

•Office hours:

- •Prof Han, immediately after class, or by appointment
- •Jack Sherman, by appointment

•Prereq: BE209, 401, 402 or equivalent

• Website: learn.bu.edu

• Suggested Textbooks (not required):

Neuroengineering, edited by Daniel Dilorenzo and Joseph Bronzino, CRC Press;

Principles of Neural Science, Eric Kandel et al, McGraw-Hill Medical; 5th edition

Summary

- Focus on current and future **neurotechnologies for analyzing** the brain, and for **understanding the principles** in designing treatment for neurological and psychiatric diseases.
- Focuses on the biophysical, biochemical, anatomical principles governing the **design of current neurotechnologies**, with a goal of encouraging innovations of a new generation of therapies.
- Topics include basic microscopic and macroscopic architecture of the brain, the fundamental properties of individual neurons and ensemble neural networks, electrophysiology, DBS, TMS, various imaging methods, optical neural control technologies, optogenetics, neuropharmacology, and gene/stem-cell therapies.
- Discussions of related literature and design projects will be involved.

22-Jan	L1	Class Overview, neural technologies overview
27-Jan	L2	Cells, cellular ephys
29-Jan	L3	Molecules, genes, histology
3-Feb	L4	Brain regions, Networks
5-Feb	L5	**Paper discussion 1**
10-Feb	L6	BMI, electrodes
12-Feb	L7	EEG ECoG
18-Feb	L8	Cellular Imaging Molecules
19-Feb	L9	**Paper discussions 2**
24-Feb	L10	Cellular Imaging Molecules
26-Feb	L11	Cellular Imaging Instrument
2-Mar	L12	Biological network, and artificial neural net. **(Problem Set 1 due by 10am)**
4-Mar	L13	**Midterm 1 (BE771 midterm design report due)**
SPRING BREAK		
16-Mar	L14	Optogenetics
18-Mar	L15	**Paper discussion 3**
23-Mar	L16	fNIR (David Boas guest lecture)
25-Mar	L17	fMRI, optogenetics applications. (Guest lectures by Laura Lewis, Howard Gritton)
30-Mar	L18	MEG, PET
1-Apr	L19	MRI, fMRI
6-Apr	L20	**Paper discussion 4**
8-Apr	L21	Electrical stimulation
13-Apr	L22	Deep brain stimulation
15-Apr	L23	Drugs, chemicals
22-Apr	L24	**Paper discussion 5**
27-Apr	L25	Final Review **(Problem Set 2 due by 10am)**
29-Apr	L26	**BE771 Final Project Presentation**