EINSTEIN
Albert Einstein College of Medicine

Graduate Programs in the Biomedical Sciences

Course Syllabus

Approaches to Study Neural Circuits in Behaving Animals

Course Leaders:
List course leaders and their email

Anita Autry anita.autry@einstein.yu.edu
Lucas Sjulson lucas.sjulson@einstein.yu.edu

Course start/end dates:
State course start and end dates or which whole Block it will be taught in

Block III March 17-May 5 (TTh 10:30am-12:30pm Kennedy 919)

Course Contact Hours:
Indicate how many hours per week

3 hours per week

Course Credit:
(To be determined by the registrar)

Course Description:
Include topics to be covered and teaching methodologies (e.g. lecture-style, team-based learning etc).

This course will introduce students to techniques for in vivo recording of neural activity and approaches to define connectivity and expression profiling of neurons. Emphasis on techniques, instrumentation, and data analysis (demos for analysis). We will introduce the basics of measurement and instrumentation for in vivo physiology, in vivo calcium imaging, and introduce methods for manipulation, anatomy, and expression profiling of neurons. A key motivation in going over the techniques will be to compare methods for recording and manipulation (i.e. physiology versus imaging, optogenetics versus chemogenetics) in terms both of the mechanisms at the level of individual neurons and how that manipulation will impact resulting data and interpretation of behavioral/activity outcomes. Course meetings will be lectures to go over the basic information as well as hands on demonstrations with equipment and example data analysis. Students will be evaluated based class participation with short formative assessments for each meeting and on a final presentation (around 15 minutes) of recent advances in the application or analysis of one of the techniques discussed in class. Attendance is required but may be excused with appropriate notice to instructors (maximum 1 unexcused absence).

Prerequisite(s):
Are undergraduate or graduate courses required? Any specific background needed?

None but neuroscience background preferred

Course Objectives:
Describe the goals of the course and expected student learning outcomes.

-understand principles of measurement and analysis
-understand the advantages and limitation of specific approaches for neural recordings
-get hands-on experience handling data sets from in vivo recording experiments
-understand the advantages and limitations of methods for manipulating neurons
-become versed in visualizing and interpreting data from neural recording and neural manipulation experiments

Required Material(s):

If students would like to follow along with data analysis demonstrations, a computer and free software (TBA) will be required. Demos will also be shown on a screen.

Suitable for 1st years (Y/N):

Y

Grading:
Describe how the course will be graded (e.g. % exam, problem sets, participation) and explicitly state the requirements for

Students will be assessed based on in-class participation and a final presentation (75% participation; 25% final presentation)

passing the class. Indicate when during the course any exams are in addition to whether feedback will be given to the student during the course regarding grades.

Meeting Sessions:

Date	Location	Time	Topic/Lecture Title	Lecturer
March 17	K919	10:30-12:30pm	Signals and data acquisition hardware	Luke, Tiago, Anita
March 19		10:30-12:30pm	Data formats, sampling, filters, convolution	Luke, Anita
March 24		10:30-12:30pm	Electrophysiology	Luke
March 26		10:30-12:30pm	Demo for electrophysiology analysis	Luke
March 31		10:30-12:30pm	Optogenetics, chemogenetics, GECIs, and GEVIs	Luke
April 2		10:30-12:30pm	In vivo imaging from photometry to miniscopes	Tiago
April 7		10:30-12:30pm	Demo for in vivo imaging	Tiago
April 21		10:30-12:30pm	Anatomical tracing techniques, lesions, and pharmacology	Anita
April 23		10:30-12:30pm	Knockouts, knockins, conditional expression	Anita
April 28		10:30-12:30pm	Tagging active cell populations and molecular profiling	Anita
April 30		10:30-12:30pm	Demo for image analysis with ImageJ	Anita
May 5		10:30-12:30pm	Assessments (student presentations)	Luke, Anita

Additional Info: