

ECE 6194.05 (Proposed): Group Studies in Neuroelectronics

Course Description

This course gives an introduction on neuroelectronics for graduate students with engineering backgrounds. Focusing on circuits and principles, this course covers neural interfaces, neural recording and stimulation, wireless power and data transfer, and system integration and introduces cutting-edge developments on neural prosthetics.

Transcript Abbreviation: Neuroelectronics

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Graduate

Student Ranks: Masters, Doctoral

Course Offerings: Spring

Flex Scheduled Course: Never

Course Frequency: Even Years

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: Graduate standing in engineering, physics, or permission of instructor.

Exclusions:

Cross-Listings:

Course Rationale: This new course will contribute to the ECE Bioengineering Curriculum and introduce the expanding field of neurotechnology to graduate students.

The course is required for this unit's degrees, majors, and/or minors: No

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Learn circuits and principles used in designing advanced medical devices and neuroprostheses.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Models of neuron excitation	3.0							
Principles of neural recording	6.0							
Principles of neural stimulation: current density distribution, second spatial derivatives of voltage, conduction block, virtual anode, selectivity	7.0							
Neural electrodes	6.0							
Neural ICs	6.0							
Wireless power and data transmission	6.0							
Neuroelectronic systems: the neural prostheses	6.0							

Grades

Aspect	Percent
Homework	20%
Midterm I	20%
Midterm II	20%
Final Project	40%

Representative Textbooks and Other Course Materials

Title	Author
<i>Lecture Notes</i>	

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
**	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
**	c	An ability to design a system, component, or process to meet desired needs.
***	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.
**	g	An ability to communicate effectively.
**	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
**	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Prepared by: Liang Guo