ECE 5070: Neuroengineering and Neuroprosthetics

Course Description

An overview of the broad field of Neuroengineering for graduate and senior undergraduate students with engineering or neuroscience backgrounds. Focusing on neural interfaces and prostheses, this course covers from basic neurophysiology and computational neuronal models to advanced neural interfaces and prostheses currently being actively developed in the field.

Transcript Abbreviation: Neur Eng & Prosth
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad, Graduate
Student Ranks: Junior, Senior, Masters, Doctoral
Course Offerings: Autumn
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: Prereq: 3050 or BME 3703; or Neurosc 3010 and permission of instructor; or Grad standing in Engineering or Neurosc.
Exclusions: Not open to students with credit for 5194.03 or Neurosc 5070.
Cross-Listings: Cross-listed in Neurosc.

Course Rationale: Introduce students a vibrant, interdisciplinary field which integrates engineering and

neuroscience principles for treating neurological disorders.

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

Master principles of neural interfaces.
Be competent with computational neural models.

Be competent with design of common neuroprostheses.
Be familiar with neuroscience basics.
Be familiar with other neural technologies
Be exposed to regulatory and ethic issues.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Overview of Neuroengineering	1.5							
Neuroscience Basics	6.0							
Computational Neuronal Models	4.5							
Neural Interfacing Technologies	6.0							
Overview of Neuroprosthetics	1.5							
Brain Computer Interface	3.0							
Deep Brain Stimulation	3.0							
Retinal Prostheses	1.5							
Functional Electrical Stimulation	3.0							
Optogenetics	3.0							
Neural Imaging	3.0							
Neural Tissue Engineering	3.0							
Regulatory and Ethic Issues	3.0							

Grades

Aspect	Percent
Class Participation and Homework	20%
Midterm I	20%
Midterm II	20%
Final Project	40%

Representative Textbooks and Other Course Materials

Title	Author
Lecture Notes	

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.

Course Contribution		College Outcome
***	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.

Additional Notes or Comments

Make consistent with university version 4/5/14

Expand course goals 4/7/16

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