BME6360: Neural Engineering
Spring 2013 (Section 4173)

Catalog Description: Applying engineering to neuroscience including such diverse areas as neural tissue engineering, models of neural function, and neural interface technology. Focuses mainly in the context of neural interfaces and prosthetics, from basic neural physiology and models of neural mechanisms to advanced neural interfaces currently in development or produced commercially.

Credits: 03

Prerequisites: Consent of instructor

Instructors:
- Aysegul Gunduz, Ph.D. (agunduz@ufl.edu)
  Biomedical Sciences Building J283 (352) 273-6877
- Ranganatha Sitaram, Ph.D. (ranganatha.sitaram@bme.ufl.edu)
  Biomedical Sciences Building J284 (352) 273-5876

Office Hours:
- Aysegul Gunduz: Monday, Period 8, 3-4 pm
- Ranganatha Sitaram: Wednesday, Period 8, 3-4 pm

Class Meetings: Tuesday, Period 7 (1:55-2:45 pm) ; Thursday, Periods 7 – 8 (1:55-3:50 pm)

Meeting Location: CHE 316

Class Homepage: http://lss.at.ufl.edu

Required textbook and software:
No textbooks are required.
Material will be posted on the class website.

Recommended reading:
Neural Engineering, He; Neuroengineering, DiLorenzo; Principles of Neural Science, Kandel; Biological Psychology, Kalat.

Course Objectives:
- Understand the basic principles of brain anatomy, chemistry and function
- Learn about the principles of neurophysiologic recording and imaging technologies
- Learn about the applications of neural engineering in sensory, motor, neurological and mental disorders
- Understand the current challenges in neural engineering and the directions in which the area is headed
Course Outline:

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Introduction to Neural Engineering</td>
<td>Areas of research, applications, challenges and promises.</td>
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<tr>
<td>The Brain</td>
<td>Basic principles of brain anatomy, chemistry and function, disorders.</td>
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<td>Measuring the Brain</td>
<td>Principles of electrophysiological recordings and neuroimaging.</td>
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<td>Neuroengineering Systems</td>
<td>Cochlear implants, retinal prosthesis; BCI, BMI, neuroprosthetics.</td>
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<td>Applications I</td>
<td>Communication and control in paralysis, brain stem stroke, vegetative state and minimally conscious states.</td>
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<td>Applications II</td>
<td>How BCIs and neurofeedback systems could be used for brain-behavior relationships in the following functions: sensation and perception, action (motor), learning and memory, reward and reinforcement, and conscious and non-conscious processing.</td>
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<td>Applications III</td>
<td>Neurehabilitation, neural restoration and repair in psychiatric and neurological brain disorders, such as stroke, Parkinson’s, spinal cord injury, pain, depression, schizophrenia, psychopathy, memory disorders, addiction and substance abuse.</td>
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<tr>
<td>Future Trends in Neural Engineering</td>
<td>Ethics, philosophy, media and sensationalization, neuromarketing, commercialization of technology and applications, patenting and copyrights, government regulations, and influence on our life and work in the future.</td>
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Grade Determination:

Quizzes: 40%,
Data analysis project or Review paper: 40%,
Attendance: 10%,
Class participation: 10%.

Grading Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B</th>
<th>B-</th>
<th>C+</th>
<th>C</th>
<th>C-</th>
<th>D+</th>
<th>D</th>
<th>D-</th>
<th>E</th>
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<tr>
<td></td>
<td>≥92</td>
<td>90-91</td>
<td>87-89</td>
<td>83-86</td>
<td>80-82</td>
<td>77-79</td>
<td>73-76</td>
<td>70-72</td>
<td>67-69</td>
<td>63-66</td>
<td>60-62</td>
<td>&lt;60</td>
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</table>

A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C-average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: [http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html](http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html).
Policies:
Class participation is required and part of the final grade. Lab can only be made up once for extraordinary circumstances with prior approval of the instructors. Lab exams can only be made up for extraordinary circumstances with prior approval of the instructors.

Academic Honesty:
All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

Students with Disabilities:
Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

UF counseling services:
Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

Software Use:
All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.