<h1 class="pageTitle">EEEN40070 Neural Engineering</h1>
<h2>Academic Year 2019/2020</h2>

This course will introduce students to the interdisciplinary field of Neural Engineering. Neural Engineering is an area of biomedical engineering that involves applying engineering principles and techniques to understand and interact with the human nervous system.

In this module, students will learn how to use engineering principles to explore the properties of excitable nerve and muscle tissue. They will develop mathematical models of nerve and muscle excitation and examine the generation of and propagation of bioelectric signals within the human body. Common methods of recording and analysing different types of electrophysiological signals (EEG, EMG and ECG) will be explored and the theory underlying the electrical stimulation of biological tissues will be developed.

These basic principles will then be applied to examine established and emerging applications of neural engineering to restore function in individuals with neurological and neuromuscular disorders in rehabilitation including functional electrical stimulation, motor and neuroprostheses and deep brain stimulation.

Students will participate in lectures, a special scientific research topic of their choice, discussion of scientific papers and laboratory work. Ethical issues related to research involving human subjects and the development of medical devices will also be examined.

Curricular information is subject to change

What will I learn?

Learning Outcomes:
On successful completion of this subject the student will be able to:

Understand the major divisions of the nervous system and the mechanisms responsible for electrical activity of cardiac, nerve and muscle tissue.

Use mathematical models to calculate ionic currents and voltages in cell membranes at rest and during excitation.

Derive and implement mathematical models to examine the mechanisms of action potential generation and propagation in excitable cells.

Apply electromagnetics principles to solve for electric fields in biological tissues arising from activation of nerve, muscle and cardiac tissues.

Predict the effects of electrical stimuli applied to biological tissues.

Design appropriate protocols for electrical or magnetic stimulation of biological tissues for clinical and research applications.

Discuss applications of biomedical engineering to restore function and to interface with the human nervous system; propose new therapies and technologies for neurorehabilitation.

Discuss ethical issues associated with the design of research studies involving human subjects and the development of medical devices.

How will I learn?

Student Effort Hours:

Student Effort Type	**Hours**
Lectures	30
Tutorial	6
Computer Aided Lab	14
Autonomous Student Learning	60
Total	**110**

Am I eligible to take this module?

Requirements, Exclusions and Recommendations

Learning Recommendations:

Students should have a background in engineering, physics, applied mathematics or a related discipline.

Module Requisites and Incompatibles

Not applicable to this module.

How will I be assessed?

Assessment Strategy

Description	Timing	Open Book Exam	Component Scale	Must Pass Component	% of Final Grade
Essay: Essay and presentation on selected special topic in Neural Engineering.	Varies over the Trimester	n/a	Graded	No	5
Lab Report: Laboratory work	Varies over the Trimester	n/a	Graded	No	45
Examination: Two 30 minute in-class quizzes and one 1 hr final exam.	Throughout the Trimester	No	Standard conversion grade scale 40%	No	50

Carry forward of passed components
Yes

What happens if I fail?

Remediation Type	Remediation Timing
In-Module Resit	Prior to relevant Programme Exam Board

Assessment feedback

Feedback Strategy/Strategies
* Feedback individually to students, post-assessment
* Group/class feedback, post-assessment

How will my Feedback be Delivered?
Not yet recorded.

Reading List

<nav class="white-box no-left-arrow zero-top-margin">
<h1 class="printOnly"><img src="https://www.ucd.ie/t4cms/ucdcollegesandschools_logo.png"> UCD Course Search
Neural Engineering (EEEN40070) </h1><h3 class="printOnly">Academic Year 2019/2020</h3> The information contained in this document is, to the best of our knowledge, true and accurate at the time of publication, and is solely for informational purposes. University College Dublin accepts no liability for any loss or damage howsoever arising as a result of use or reliance on this information.

<h4 class="noPrint">Neural Engineering (EEEN40070)</h4>
<dl>
<dt>Subject:</dt>
<dd>Electronic & Electrical Eng</dd>
<dt>College:</dt>
<dd>Engineering & Architecture</dd>
<dt>School:</dt>
<dd>Electrical & Electronic Eng</dd>
<dt>Level:</dt>
<dd>4 (Masters)</dd>
<dt>Credits:</dt>
<dd>5.0</dd>

<dt>Trimester:</dt>
<dd>Spring</dd>
<dt>Module Coordinator:</dt>
<dd>Professor Madeleine Lowery</dd>
<dt>Mode of Delivery:</dt>
<dd>Face-to-Face</dd>
<dt>Internship Module:</dt><dd>No</dd>

<dt>How will I be graded?</dt>
<dd>Letter grades </dd>

</dl>
<button class="menubutton" onclick="window.print()"><i class="fa fa-print fa-fw"> Print Page</button>
(Google Chrome is recommended when printing this page)

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