

<b>Module Code</b>	<b>PG7914 (School of Medicine)</b>
<b>Module Name</b>	<b>Neural Engineering</b>
<b>ECTS Weighting</b>	5 ECTS
<b>Semester taught</b>	1
<b>Module Coordinator/s</b>	Professor Richard Reilly School of Medicine
<b>Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline</b>	<p>On successful completion of this module, students should be able to:</p> <p>LO1 Describe quantitative methods for the monitoring of neural activity  LO2 Select materials for their properties in order to acquire neural activity  LO3 Design paradigms to elicit &amp; select appropriate methods to analyse neural activity for clinical and research applications  LO4 Analyse the effects of electrical stimuli applied to biological tissues  LO5 Design paradigms for selective electrical stimulation of biological tissues for clinical and research applications  LO6 Describe &amp; discuss applications of neural engineering to restore function &amp; interface with human nervous system</p> <p>Graduate Attributes: levels of attainment</p> <p>To act responsibly - Enhanced  To think independently - Enhanced  To develop continuously – Enhanced  To communicate effectively - Enhanced</p>

<b>Module Content</b>	<p>This module aims to introduce students to the field of neural engineering from a neuroscience perspective. Students will apply engineering principles to understand the excitation of nerves and muscles, the generation of bioelectric signals, and the stimulation of biological tissue. Common methods of stimulating, recording, and analysing neural systems will be examined. The basic principles and methods studied will then be applied to examine specific neuroscience applications of neural engineering, such as biomarkers for neurological and neurodegeneration and neuromodulation for neurological and psychiatric disorders.</p> <p>Section 1 Monitoring, Analyzing and Interpreting Neural Activity</p> <ul style="list-style-type: none"> <li>• Monitoring neural activity: Bioelectric potentials and currents</li> <li>• Implantable microelectrodes</li> <li>• Neural spike trains and their analysis</li> <li>• Electroencephalography EEG</li> <li>• Non-invasive Brain Machine Interfaces</li> <li>• Invasive Brain Machine Interfaces</li> <li>• Magnetic stimulation of biological tissues</li> <li>• Speech and Gait as a window into Cognitive Function</li> </ul> <p>Section 2 Replacing/Restoring Neural Function</p> <ul style="list-style-type: none"> <li>• Electric stimulation of biological tissues</li> <li>• Deep brain stimulation</li> <li>• Retinal and Visual Prostheses</li> <li>• Cochlear Implants and Auditory Prostheses</li> </ul>
<b>Teaching and Learning Methods</b>	<p>The module is taught using a combination of lectures and discussions. A reading list is also provided.</p>
<b>Module pre-requisites</b>	<p>MEU33B10 Quantitative Physiology</p>
<b>Assessment Modes</b>	<p>Written Exam (100%)  Co-ordinated and scheduled by the Dept of Physiology, School of Medicine</p> <p>Reassessment will consist of a 2hr formal written exam.</p>
<b>Recommended texts</b>	<p>Neural Engineering He (ed), Springer  Handbook on Neural Engineering Akay (ed), Wiley-IEEE Press  Neural Engineering Eliasmith, Anderson, MIT Press</p>