BMEN90002 Neural Information Processing

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2011, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 3 hours lecture , one hour tutorial per week and up to 24 hours workshop Total Time Commitment: 120 hours
Prerequisites:	Prerequisite for this subject is : **Subject** / **Study Period Commencement:** / **Credit Points:** BMEN30006 Fundamentals of Biosignals / Semester 1 / 12.50 OR equivalent
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Anti-requisite for this subjects are : BMEN30001(431-336) Neurons: From Action Potential to Learning **Subject** / **Study Period Commencement:** / **Credit Points:** BMEN90004 Advanced Neural Information Processing / Not offered 2011 / 12.50
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry. The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/
Contact:	Dr. David Grayden Email: **grayden@unimelb.edu.au (mailto:grayden@unimelb.edu.au)**
Subject Overview:	This subject introduces students to the basic mechanisms of information processing and learning in the brain and nervous system. Topics covered include: neural information processing analysed using information theoretic measures; generation and propagation of action potentials (spikes); Hodgkin-Huxley equations; coding and transmission of neural information (spiking rate, correlation and synchronisation); neural models (binary, rate based, integrate & fire, Hodgkin-Huxley, and multicompartmental); synaptic plasticity and learning in biological neural systems (synaptic basis of learning, short term, medium term and long term, and rate based Hebbian learning models); spike-timing dependent plasticity (STDP) of synapses; higher order neural pathways and systems (cortical structure and circuits). Material will be reinforced through MATLAB and/or NEURON based tutorials and laboratories
Objectives:	On successful completion of this subject, students should be able to: # Describe the structure and function of the nervous system;

	# Calculate equilibrium neural properties; # Describe the types and properties of synapses; # Describe the membrane mechanisms underlying the generation of action potentials; # Interpret neural responses in terms of point processes (Poisson); # Evaluate neural processing using information theoretic measures; # Implement and analyse the input-output characteristics of simple and biologically-detailed neural models; # Describe the principles underlying the analysis of biological neural signals; # Describe the mechanisms underlying learning in the brain and nervous system; # Describe higher-order neural pathways and systems
Assessment:	One mid-semester examination of one hour duration (20%). Four laboratory assignments based upon projects using MATLAB and/or NEURON due throughout weeks 4-12 (40%). One end-of-semester examination of two hours duration (40%).
Prescribed Texts:	None
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	# Ability to apply knowledge of science and engineering fundamentals # Ability to undertake problem identification, formulation, and solution # Ability to utilise a systems approach to complex problems and to design and operational performance # Ability to conduct an engineering project
Related Course(s):	Master of Biomedical Engineering Postgraduate Certificate in Engineering
Related Majors/Minors/ Specialisations:	Master of Engineering (Biomedical)