431-336 Neurons:From Action Potential to Learn'g

Credit Points:	12.50
Level:	3 (Undergraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 2, - Taught on campus.
Time Commitment:	Contact Hours: Twenty-four hours of lectures, 12 hours of tutorials and 12 hours of laboratory work. Total Time Commitment: Not available
Prerequisites:	**431-202** Engineering Analysis B or equivalent and **421-286** Bioengineering Systems Modelling 2 or **431-221** Fundamentals of Signals and Systems and **431-325** Stochastic Signals and Systems
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	None
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Student Support and Engagement Policy, academic requirements for this subject are articulated in the Subject Overview, Learning Outcomes, Assessment and Generic Skills sections of this entry. It is University policy to take all reasonable steps to minimise the impact of disability upon academic study, and reasonable adjustments will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact on meeting the requirements of this subject are encouraged to discuss this matter with a Faculty Student Adviser and Student Equity and Disability Support: http://services.unimelb.edu.au/disability
Coordinator:	Mr David Bruce Grayden
Subject Overview:	This subject introduces students to the basic mechanisms of information processing and learning in the brain and nervous system. Topics include: neural properties underlying information processing in neurons; generation and propagation of action potentials (spikes); Hodgkin-Huxley equations; coding and transmission of neural information (spiking rate, correlation and synchronisation); simplified neural models (binary, rate-based, integrate & fire and Hodgkin-Huxley); 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).
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 process (Poisson); calculate the key measures of neural information based upon spike timing information; implement and analyse the input-output characteristics of simplified neural models; describe the mechanisms underlying learning in the brain and nervous system. Material will be reinforced through MATLAB based tutorials and laboratories.
Assessment:	One written examination of three hours (60%), Matlab based laboratory work(40%).
Prescribed Texts:	None
Recommended Texts:	Information Not Available
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 basic science and engineering fundamentals; # ability to communicate effectively, not only with engineers but also with the community at large; # ability to understake problem identification, formulation and solution. # ability to utilise a systems approach to design and operational performance. # ability to function effectively as an individual and in multi-disciplinary teams, with the capacity to be a leader or manager as well as an effective team leader. # understanding of the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development # understanding of professional and ethical responsibilities and commitment to them # capacity for independent critical thought, rational inquiry and self-directed learning # profound respect for truth and intellectual integrity and for the ethics of scholarship
Related Course(s):	Bachelor of Engineering (Biomedical)Biosignals Bachelor of Engineering (Electrical Engineering)