431-672 Neural Information Processing

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 1, - Taught on campus.
Time Commitment:	Contact Hours: 36 Hours; Non contact time commitment 84 Hours Total Time Commitment: Not available
Prerequisites:	None
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:	Prof Anthony Burkitt
Subject Overview:	This subject introduces students to the basic mechanisms of information processing in the brain and nervous system, as well as both neural prostheses (that interface the neural system with therapeutic electrical devices) and artificial systems based upon the principles of neural processing (neuromorphic engineering). Topics covered include: neural properties underlying information processing in neurons, generation and propagation of action potentials (spikes), Hodgkin-Huxley equations, coding and transmission of neural information, simplified neural models, synaptic plasticity and learning in biological neural systems, learning in artificial neural systems, measurement of biological neuralsignals, neural prostheses, neuromorphic engineering.
Objectives:	On successful completion, students should be able to: # describe the structure and function of the nervous system # interpret various measures of single-neuron responses # calculate equilibrium neural properties using the Nernst equation # describe the membrane mechanisms underlying the generation of action potentials # describe the mechanisms underlying learning in the brain and nervous system # identify and describe the principles underlying different biologically inspired machine learning algorithms # implement and evaluate an artificial learning algorithm on a computer # describe the principles underlying the analysis of biological neural signals # interpret an electroencephalogram (EEG) # describe the principles underlying various types of neural prostheses # describe the principles of neuromorphic engineering and their application in robotics and neural control
Assessment:	One 1-hour test (10%), one 2-hour examination (40%) and two assignments of 3,000 words equivalent each (50%) including a presentation and a computer-based project using MATLAB.

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:	1. ability to apply knowledge of basic science and engineering fundamentals; 2. ability to communicate effectively, not only with engineers but also with the community at large; 3. ability to undertake problem identification, formulation and solution; 4. ability to utilise a systems approach to design and operational performance. 5. 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. 6. 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 7. 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):	Master of Biomedical Engineering Master of Engineering Science(Biomedical Enginering)