BMEN90004 Advanced Neural Information Processing

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 24 hours of lectures Total Time Commitment: 200 hours
Prerequisites:	Enrolment in a research higher degree (Master by Research or PhD) in Engineering.
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Credit may not be obtained for both BMEN90004 and the following subject

Subject	Study Period Commencement:	Credit Points:
BMEN90002 Neural Information Processing	Semester 2	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/
Coordinator:	Prof Anthony Burkitt
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Subject Overview:	**AIMS** This subject has a twofold aim. First, it introduces students to the basic mechanisms of information processing in the brain and nervous system and then explores five areas in more depth. The topics covered in more depth are: (1) neural modelling; (2) neuroimaging; (3) mean-field models of neural activity; (4) neural learning; (5) neural information. Second, it introduces students to a number of important research skills: (i) how to prepare and present a poster, (ii) how to prepare and lead a journal club discussion, and (iii) how to provide feedback on the presentations of other students. **INDICATIVE CONTENT** Topics include: Introduction to neural information processing, neural modelling, neuroimaging, mean-field models of neural activity, neural Information, neural learning.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO's)** Having completed this unit the student is expected to: 1 Describe the principles underlying neural modelling and be familiar with the strengths and limitations of the main classes of neural models. 2 Describe the principles underlying the various forms of neuroimaging, as well as their strengths and limitations.

	3 Describe the modelling of membrane ion channels and their relation to the Hodgkin-Huxley equations. 4 Describe the mechanisms underlying learning in the brain and nervous system, as well as how they can be implemented in artificial (biologically inspired machine learning) algorithms. 5 Describe the ways in which information theory is used in understanding neural systems.
Assessment:	A poster presentation on a journal or conference paper to be delivered during weeks 5-12, requiring approximately 25-30 hours of work (20%) A journal club presentation of 45 minutes duration on one or more journal articles (20%) and a written report of 2000 words on the article(s) presented in the journal club due during weeks 5-12, requiring approximately 60-70 hours of work (30%) Three feedback critiques of 750 words each on journal club presentations due during weeks 5-12, requiring approximately 35-40 hours of work (30%). Intended Learning Outcomes (ILO's) 1, 2, 3, 4 and 5 are assessed in a poster presentation, journal club, written report and three feedback critiques.
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:	On completion of this subject, students should have developed the following 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 undertake 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.
Notes:	**LEARNING AND TEACHING METHODS** The subject is delivered through lectures, journal clubs and poster presentations. Each student delivers one journal club presentation and one poster presentation to the class. Each student provides a critique of other students' journal club presentation. **INDICATIVE KEY LEARNING RESOURCES** Students are provided with lecture slides, conference papers and journal papers. **CAREERS / INDUSTRY LINKS** Each topic is taught by a different person, with research institute and/or industry guest lecturers delivering some of the content.
Related Course(s):	Doctor of Philosophy - Engineering Master of Philosophy - Engineering