BMEN90021 Medical Imaging

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2014.
Time Commitment:	Contact Hours: 48 hours of lectures, tutorials and workshops (30 hours of lectures, 6 hours of tutorials, and 4 x three hour workshops) per semester Total Time Commitment: 200 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-requisites for this subject are: **Subject** | **Study Period Commencement:** | **Credit Points:** BMEN90005 Neuroimaging Methods and Applications | Not offered 2014 | 12.50 BMEN40006 Neuroimaging Methods | Not offered 2014 | 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:	Email:**l.johnston@unimelb.edu.au (mailto:l.johnston@unimelb.edu.au)**
Subject Overview:	**AIMS** This subject introduces students to the engineering, physics and physiology of medical imaging, including the history and progression of medical imaging modalities as well as emerging imaging technologies in clinical and research practise. Topics covered include: x-ray, computed tomography, positron emission tomography, magnetic resonance imaging and ultrasound. **INDICATIVE CONTENT** Topics include: Image metrics including signal-to-noise and contrast-to-noise ratios, image resolution, image operations including convolution, filtering and edge detection; Biophysical principles of X-ray, CT, PET, SPECT, MRI and ultrasound, and the mathematics of image reconstruction for each modality, including filtered backprojection and fourier reconstruction methods;

	This material is complemented by the use of software tools (e.g. MATLAB) for data simulation, modelling, image manipulation and reconstruction techniques.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** Having completed this unit the student should be able to: 1 Describe the principles of the modalities of medical imaging systems; 2 Describe the physics and physiology fundamental to these imaging systems; 3 Apply the mathematics of each imaging modality; 4 Compute image reconstructions using back-projection methods; 5 Compute image reconstructions using fourier transform methods; 6 Identify basic causes of image contrast and artefacts; 7 Describe clinical applications of each imaging modality; 8 Apply their knowledge to understanding emerging medical imaging technologies.
Assessment:	One mid-semester examination of one hour duration (10%); Four laboratory assignments each 375 words per student, based upon projects using MATLAB due throughout weeks 2-12 (30%); One end-of-semester examination of three hours duration (60%). Hurdle requirement: Students must pass end of semester examination to pass the subject. Intended Learning Outcomes (ILOs) 1, 2, 3, 6, 7 and 8 are assessed in the final written examination and the mid-semester test. ILOs 3, 4, 5, 6 and 7 are assessed through the laboratory assignments and submitted reports for two projects.
Prescribed Texts:	TBA
Recommended Texts:	"Fundamentals of Medical Imaging" by Paul Suetens, 2nd edition, Cambridge University Press 2009.
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 # Proficiency in engineering design # Ability to conduct an engineering project # Ability to communicate effectively, with the engineering team and with the community at large # Ability to manage information and documentation # Capacity for creativity and innovation # Capacity for lifelong learning and professional development
Notes:	**LEARNING AND TEACHING METHODS** The subject is delivered through lectures, tutorials and workshop classes for hands-on laboratory activities. **INDICATIVE KEY LEARNING RESOURCES** Students are provided with lecture slides, tutorials with worked solutions, laboratory sheets, and reference text lists. **CAREERS / INDUSTRY LINKS** Exposure to medical imaging in clinical and research settings through guest lectures, and hospital and laboratory visits.
Related Course(s):	Bachelor of Engineering (Biomedical)Biosignals Master of Biomedical Engineering Master of Philosophy - Engineering Ph.D.- Engineering

Related Majors/Minors/ Specialisations:	Master of Engineering (Biomedical)