BMEN30006 Fundamentals of Biosignals

Credit Points:	12.50
Level:	3 (Undergraduate)
Dates & Locations:	This subject is not offered in 2014.
Time Commitment:	Contact Hours: 3 x one hour lectures per week, 1 x one hour tutorial per week, and 6 x 2 hour workshops per semester Total Time Commitment: 170 hours
Prerequisites:	The prerequisites for this subject are: One of the following subjects

Subject	Study Period Commencement:	Credit Points:
ENGR10004 Engineering Systems Design 1	Semester 1, Semester 2	12.50
ENGR10003 Engineering Systems Design 2	Summer Term, Semester 2	12.50
ENGR90021 Engineering Communication	Semester 1, Semester 2	12.50

PLUS

Subject	Study Period Commencement:	Credit Points:
COMP20005 Engineering Computation	Semester 1, Semester 2	12.50

PLUS

Subject	Study Period Commencement:	Credit Points:
MAST20029 Engineering Mathematics	Summer Term, Semester 1, Semester 2	12.50

OR

both of the following subjects

Subject	Study Period Commencement:	Credit Points:
MAST20009 Vector Calculus	Semester 1, Semester 2	12.50
MAST20030 Differential Equations	Semester 2	12.50

COMP20005 Engineering Computation, MAST20029 Engineering Mathematics and ENGR90021 Engineering Communication may be taken concurrently

Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Anti- requisites for this subject are:

Subject	Study Period Commencement:	Credit Points:

	431-221 Fundamentals of Signals and Systems	Not offered 2010	
	ELEN30012 Signals and Systems	Semester 2	12.50

Core Participation Requirements:

For the purposes of considering applications for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005) and Students Experiencing Academic Disadvantage Policy, this subject requires all students to actively and safely participate in laboratory activities. Students who feel their disability may impact upon their participation are encouraged to discuss this with the Subject Coordinator and the Disability Liaison Unit. http://www.services.unimelb.edu.au/disability/

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Subject Overview:

AIMS

This subject introduces students to the fundamental principles of signals measurement and analysis in a biosignals context. In addition to the fundamental concepts, topics to be covered include an introduction to various types of sensors and the basic physical phenomena underpining their operation as well as the basic statistics required to analyse measurements, calibrate sensors and evaluate measurement system performance.

In the laboratories, students will learn about laboratory safety, team work and measurement safety in an integrated way. Students will learn how to measure a range of variables to monitor various biosignals, such as electrocardiogram (ECG), electromyogram (EMG), and electrocencephalogram (EEG) signals.

This subject is one of the subjects that define the Bioengineering Systems Major in the Bachelor of Science and Bachelor of Biomedicine, and it is a core requirement for the Master of Engineering (Biomedical). It provides a foundation for various subsequent subjects, including BMEN90002 Neural Information Processing and BMEN90021 Medical Imaging.

INDICATIVE CONTENT

Topics include:

Basic principles of charge, current, Coulomb's law, electric fields and electrical energy, Kirchhoff's current law, Kirchhoff's voltage law, frequency domain models for signals and frequency response for systems, continuous-time and discrete-time Fourier transforms, frequency response, filtering, transfer functions, Z-transforms, Laplace transforms, poles and zeros, Bode plots, and the relationship to state-space representations.

This material is complemented by the use of software tools (e.g. MATLAB) for computation and simulation, and practical experience with circuits and biosensors in the laboratory.

Learning Outcomes:

INTENDED LEARNING OUTCOMES (ILO)

Having completed this unit the student should be able to:

1. Analyse signals in a biosignals context;
2. Design a solution to a particular sensing problem;
3. Explain the fundamentals of the operation of sensors and transducers for the measurement of biosignals;
4. Use a range of laboratory equipment to measure these quantities;

Assessment:

Six workshop group reports (students work in group of 2 or 3) not exceeding 30 pages in total each spread from week 2 to week 12 , worth 30%; One mid-semester test of one hour duration, worth 10%; One examination of two hours duration at the end of the semester, worth 60%; Hurdle requirement: Students must pass the end of semester examination to pass the subject. Intended Learning Outcomes (ILOs) 1, 2 and 3 are assessed in the final written examination and the mid-semester test. ILOs 1-4 are assessed in the submitted workshop reports.

Prescribed Texts:

To be advised

Breadth Options:

This subject potentially can be taken as a breadth subject component for the following courses:

Bachelor of Arts (https://handbook.unimelb.edu.au/view/2014/B-ARTS)

	# **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2014/B-COM)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2014/B-MUS)** You should visit **learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)** and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.
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 their: # 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 communicate effectively, with the engineering team and with the community at large. # Capacity for creativity and innovation. # Ability to function effectively as an individual and in multidisciplinary and multicultural teams, as a team leader or manager as well as an effective team member. # 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 and worked solutions, a problem set and solutions, problem sets, laboratory sheets, and reference text lists. **CAREERS / INDUSTRY LINKS** Exposure to signal processing in a bioengineering context through research lab visits and/or guest lectures.
Related Majors/Minors/ Specialisations:	Bioengineering Systems Master of Engineering (Biomedical) Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED