UNSW Course Outline

BIOM9640 Biomedical instrumentation - 2024

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General Course Information

Course Code : BIOM9640
Year : 2024
Term : Term 3
Teaching Period : T3
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : Graduate School of Biomedical Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate, Postgraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course serves as an introduction to physiological measurement of bioelectric phenomena and neurostimulation. This course deals primarily with gaining an understanding of the physical principles which govern the measurement of a biological variable or system, by a transducer

which converts the variable into an electrical signal. By the end of the course you should understand various measurement devices and approaches including the underlying biological process that generates the quantity to be measured or controlled. The basic medical instrumentation used clinically to perform these functions is also examined. This course has a focus on bioelectric phenomena, bioelectrodes, medical electronics and neurostimulation. The course includes a revision of DC and AC circuit theory, hands-on practice in the use and testing of medical transducers and electromedical equipment in common use in hospitals and research laboratories to make measurements of biomedical variables of clinical significance.

Course Aims

The aims of this course are to:

- introduce students to the fundamentals of electrical engineering as it relates to understanding bioelectric phenomena and neural stimulation
- understand the physical principles which govern the measurement of a biological variable or system by a transducer which converts the variable into an electrical signal
- understand various measurement devices and approaches including the underlying biological process that generates the quantity to be measured or controlled

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Identify the scope of biomedical instrumentation and its applications
CLO2 : Explain fundamental general transduction and biosensing principles
CLO3 : Discuss, develop and apply electrical engineering concepts and principles to a range of problems and medical applications
CLO4 : Critically review the literature in the area and use this knowledge to analyse simple biosensing and transduction problems
CLO5 : Summarise and communicate findings from literature research using oral and written methods

Course Learning Outcomes	Assessment Item
CLO1 : Identify the scope of biomedical instrumentation and its applications	• Tutorials, Hand in Questions • Quizzes
CLO2 : Explain fundamental general transduction and biosensing principles	• Laboratory Report & Attendance • Final Exam • Tutorials, Hand in Questions • Quizzes
CLO3 : Discuss, develop and apply electrical engineering concepts and principles to a range of problems and medical applications	• Final Exam • Tutorials, Hand in Questions • Quizzes
CLO4 : Critically review the literature in the area and use this knowledge to analyse simple biosensing and transduction problems	• Laboratory Report & Attendance • Final Exam
CLO5 : Summarise and communicate findings from literature research using oral and written methods	• Laboratory Report & Attendance

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Laboratory Report & Attendance Assessment Format: Individual	25%	Start Date: Not Applicable Due Date: Not Applicable
Tutorials, Hand in Questions Assessment Format: Individual	15%	Start Date: Not Applicable Due Date: Not Applicable
Final Exam Assessment Format: Individual	40%	Start Date: Not Applicable Due Date: Not Applicable
Quizzes Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Laboratory Report & Attendance

Assessment Overview

It is expected that students will attend all laboratory classes and document results and discussion in a formal laboratory book. This book will be marked for completeness and consistency with a set of laboratory notebook guidelines that will be supplied to the student. The first laboratory involving using an oscilloscope is also assessable.

One laboratory will be chosen, and the student will be expected to prepare a formal laboratory report that will include results, discussion, error sources and reference to relevant literature. The objectives of the major report are to consolidate information learned in class and to develop critical data analysis and literature research skills. Details on how to complete the major lab report will be provided after week 7.

Related graduate capabilities include:

- Capable of independent and collaborative inquiry
- Capable of effective communication
- Information literate
- Enterprising, innovative and creative
- Collaborative and effective team workers
- Understanding of the discipline in its interdisciplinary context
- Rigorous in analysis, critique and reflection
- Able to apply knowledge and skills to solving problems
- Capable of independent, self-directed practice
- Capable of lifelong learning

Course Learning Outcomes

- CLO2 : Explain fundamental general transduction and biosensing principles
- CLO4 : Critically review the literature in the area and use this knowledge to analyse simple biosensing and transduction problems
- CLO5 : Summarise and communicate findings from literature research using oral and written methods

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
For more information on Generative AI and permitted use please see here.

Tutorials, Hand in Questions

Assessment Overview

A major aspect of this course is problem solving. This entails choosing the appropriate model, implementing it correctly and arriving at the correct answer. To complete the tutorials, students will use fundamental material from the lectures. Tutorials should be submitted on time through Moodle. Marks may be deducted for late submission without prior approval.

Related graduate capabilities include:

- Understanding of the discipline in its interdisciplinary context
- Rigorous in analysis, critique and reflection
- Able to apply knowledge and skills to solving problems

Course Learning Outcomes

- CLO1 : Identify the scope of biomedical instrumentation and its applications
- CLO2 : Explain fundamental general transduction and biosensing principles
- CLO3 : Discuss, develop and apply electrical engineering concepts and principles to a range of problems and medical applications

Generative AI Permission Level

No Assistance

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Final Exam

Assessment Overview

The final exam may be made up of any of the following: true/false, multiple choice, matching, short answer and essay questions. The aims of this assessment are to encourage students to review the entire course including laboratory work and to allow students to apply all the knowledge disseminated to solve problems. This assessment is a direct test of the degree to which the knowledge-based learning outcomes listed above have been achieved. Further details on the final exam will be announced during the term.

Related graduate capabilities include:

- Understanding of the discipline in its interdisciplinary context
- Rigorous in analysis, critique and reflection
- Able to apply knowledge and skills to solving problems
- Capable of independent, self-directed practice

Course Learning Outcomes

- CLO2 : Explain fundamental general transduction and biosensing principles
- CLO3 : Discuss, develop and apply electrical engineering concepts and principles to a range of problems and medical applications
- CLO4 : Critically review the literature in the area and use this knowledge to analyse simple biosensing and transduction problems

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

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Quizzes

Assessment Overview

Two 20-min quizzes are scheduled through the term. Both consist of short answer questions and/or multiple-choice questions in a format similar to the final exam. The aims of these assessments are to encourage student revision during the course and to allow students to gauge

their progress in different topics and receive feedback on that progress. These assessments are a direct test of the degree to which the knowledge-based learning outcomes listed above have been achieved. The quizzes will take place in Moodle, at the first 15-20 min of the weekly lecture timeslot. These will be invigilated through MS Teams video conferencing by your lecturers.

Related graduate capabilities include:

- Understanding of the discipline in its interdisciplinary context
- Rigorous in analysis, critique and reflection
- Able to apply knowledge and skills to solving problems
- Capable of independent, self-directed practice

Course Learning Outcomes

- CLO1 : Identify the scope of biomedical instrumentation and its applications
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- CLO3 : Discuss, develop and apply electrical engineering concepts and principles to a range of problems and medical applications

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

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General Assessment Information

Grading Basis

Standard

Course Schedule

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	David Tsai					No	Yes

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable

Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures

can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School Contact Information

Student Services can be contacted via unsw.to/webforms.