UNSW Course Outline

BIOM1010 Engineering in Medicine and Biology - 2024

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General Course Information

Course Code : BIOM1010
Year : 2024
Term : Term 2
Teaching Period : T2
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
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Embark on a transformative journey at the intersection of engineering and healthcare with our dynamic course in biomedical engineering. You will explore the fundamental principles of engineering as applied to medicine and biology, delving into captivating topics such as artificial

organs, medical imaging, and tissue engineering. Gain insights into the innovative technologies revolutionizing healthcare, from the development of artificial respirators to surgical robots. Through a blend of theoretical exploration and practical applications, you will discover how engineering concepts drive groundbreaking solutions to complex challenges in the biomedical field.

Course Aims

Within the broader program of biomedical engineering, this course aims to serves as the foundational cornerstone, laying the groundwork for future learning and exploration. Building upon prerequisite knowledge in engineering fundamentals, it exposes students to analytical skills and practical expertise that can be applied to address engineering challenges in medicine and biology. Ultimately, the intention is to inspire and empower students, providing them with the knowledge and tools they need to make meaningful contributions to the advancement of healthcare through engineering innovation.

The specific aims are to:
1. Introduce the student to some basic concepts in several branches of engineering with applications in medicine.
2. Introduce the student to selected applications of engineering and technology in medicine.
3. Introduce the student to selected areas of physiology, which can be viewed as engineering solutions to problems of life.
4. Develop the student's ability to analyse and solve problems in the biomedical engineering area.
5. Improve the student's writing skills.
6. Enhance the student's skill at using information resources.

Relationship to Other Courses

No direct relationship to other courses

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Describe several applications of engineering and technology to medicine/biology.
CLO2 : Apply basic mathematics, physics, and engineering methods to solve biomedical problems.
CLO3 : Evaluate specific applications of technology to medicine/biology.
CLO4 : Develop a concise and professional report detailing a specific application of technology in medicine/biology using the languages of engineering and medicine/biology, and present this information orally.

Course Learning Outcomes	Assessment Item
CLO1 : Describe several applications of engineering and technology to medicine/ biology.	• Major Assignment • Weekly Quizzes • Individual Report
CLO2 : Apply basic mathematics, physics, and engineering methods to solve biomedical problems.	• Major Assignment • Weekly Quizzes
CLO3 : Evaluate specific applications of technology to medicine/biology.	• Active Participation • Individual Report • Major Assignment • Weekly Quizzes
CLO4 : Develop a concise and professional report detailing a specific application of technology in medicine/biology using the languages of engineering and medicine/ biology, and present this information orally.	• Individual Report • Major Assignment • Weekly Quizzes

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

Learning and Teaching in this course

This course employs a combination of lectures, interactive group activities, hands-on tutorials, and regular feedback to provide students with a comprehensive understanding of biomedical engineering principles and their applications in medicine and biology. The rationale behind these teaching strategies is to foster active engagement, critical thinking, and practical problem-solving skills among students, preparing them for real-world challenges in the field.

Lectures serve as a platform for introducing key concepts and theoretical frameworks underlying biomedical engineering principles and their applications. Theory-supported experimental methods are discussed to acquaint students with the fundamental principles guiding the design and development of biomedical technologies. By providing a theoretical foundation, lectures enable students to grasp the essential engineering concepts necessary for solving biomedical problems and understanding cutting-edge technologies.

At the conclusion of each lecture session, interactive group activities are integrated to reinforce understanding and facilitate collaborative learning. Practical research problems are presented to students, encouraging them to apply the theoretical knowledge gained during lectures to real-

world scenarios. Through group discussions and problem-solving exercises, students engage in active learning, enhancing their analytical skills and ability to critically evaluate engineering solutions in the biomedical domain.

Tutorials are structured to complement lecture materials by offering practical demonstrations and hands-on experiences. Design and Build group projects are incorporated into tutorials to provide students with opportunities to translate theoretical concepts into tangible solutions. By participating in group projects, students gain valuable experience in designing, prototyping, and testing biomedical devices, reinforcing their understanding of engineering principles in practical contexts.

Throughout lectures and tutorials, regular feedback is provided to students to support their learning progress and development. Feedback mechanisms are implemented during interactive group activities and hands-on tutorials to offer timely guidance and support to students. This iterative feedback loop encourages continuous improvement, allowing students to refine their problem-solving skills and enhance their ability to communicate and collaborate effectively in multidisciplinary teams. Overall, these teaching strategies are designed to create an immersive learning environment that cultivates curiosity, creativity, and proficiency in biomedical engineering, empowering students to tackle complex challenges and contribute meaningfully to advancements in medicine and biology.

Within the broader program of biomedical engineering, this course aims to serve as the foundational cornerstone, laying the groundwork for future learning and exploration. Building upon prerequisite knowledge in engineering fundamentals, it exposes students to analytical skills and practical expertise that can be applied to address engineering challenges in medicine and biology. Ultimately, the intention is to inspire and empower students, providing them with the knowledge and tools they need to make meaningful contributions to the advancement of healthcare through engineering innovation.

Other Professional Outcomes

Other outcomes

N/A

Additional Course Information

Lectures are included in the first hour of each tutorial (all in face-to-face format). All classes will be in Mathews Building, Room 103. These will cover the theory-supporting experimental

methods and the practical research problems with an interactive group activity in each session. Tutorials are designed to explain the concepts introduced in the lectures using practical approaches through Design and Build group projects. These strategies are intended to support you in attaining the learning outcomes. Content, including notes and videos, will be available via Moodle and in the class. Feedback will be provided regularly during the group activities in lectures and totorials.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Major Assignment Assessment Format: Individual	50%	
Weekly Quizzes Assessment Format: Individual	15%	
Individual Report Assessment Format: Individual	25%	
Active Participation Assessment Format: Individual	10%	

Assessment Details

Major Assignment

Assessment Overview

Group report (30%), individual contribution through Video presentation (15%), and mentor mark (5%)

This is a group activity (typically 5 students per group), consisting of a major report and group prototype presentation (CLO4). This is not a Turnitin assignment. In the group project, individual contribution is assessed through a "Video presentation" and a "Mentor Mark". The 3min Video Presentation is an individual assessment at the end of the term. During the project, mentors will assess individual contributions based on engagement and collaborative approach in Build & Design activities.

Course Learning Outcomes

- CLO1 : Describe several applications of engineering and technology to medicine/biology.
- CLO2 : Apply basic mathematics, physics, and engineering methods to solve biomedical problems.
- CLO3 : Evaluate specific applications of technology to medicine/biology.

- CLO4 : Develop a concise and professional report detailing a specific application of technology in medicine/biology using the languages of engineering and medicine/biology, and present this information orally.

Assignment submission Turnitin type

This is not a Turnitin assignment

Weekly Quizzes

Assessment Overview

Weekly quizzes on digital platforms, which integrate concepts from lectures into tutorial practices. There will be 8 quizzes in total from weeks 3-10.

Course Learning Outcomes

- CLO1 : Describe several applications of engineering and technology to medicine/biology.
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- CLO3 : Evaluate specific applications of technology to medicine/biology.
- CLO4 : Develop a concise and professional report detailing a specific application of technology in medicine/biology using the languages of engineering and medicine/biology, and present this information orally.

Individual Report

Assessment Overview

One page Perspective Report that will be submitted individually at the end of the term.

Course Learning Outcomes

- CLO1 : Describe several applications of engineering and technology to medicine/biology.
- CLO3 : Evaluate specific applications of technology to medicine/biology.
- CLO4 : Develop a concise and professional report detailing a specific application of technology in medicine/biology using the languages of engineering and medicine/biology, and present this information orally.

Active Participation

Assessment Overview

Individual marks based on participation and engagement in discussions and class attendance during tutorials

Course Learning Outcomes

- CLO3 : Evaluate specific applications of technology to medicine/biology.

General Assessment Information

Further information related to the assessment will be provided in the Moodle and face-to-face classes.

Grading Basis

Standard

Requirements to pass course

Achieve a composite mark of at least 60 out of 100

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Welcome to BIOM1010; course introduction, team building, meet the mentors Followed by face-2-face tutorial Tutorial: Arduino part 1
Week 2 : 3 June - 9 June	Lecture	Lecture: Medical technology, information finding, literature review, project selection Tutorial: Arduino part 2
Week 3 : 10 June - 16 June	Lecture	Clinical needs, brainstorming Ideas and referencing style, design & build project Tutorial: 3D Modelling
Week 4 : 17 June - 23 June	Lecture	Lecture: Device assessment, data presentation and evaluation, group project proposal with feedback including peers evaluation Tutorial: Group project
Week 5 : 24 June - 30 June	Lecture	Ethics: just because we can..., introduction to medical device ethics, discussions on some medical scenarios, design and build project Tutorial: Group project
Week 6 : 1 July - 7 July	Workshop	Flexible Week, workshop (Q&A) Tutorial: Group project
Week 7 : 8 July - 14 July	Lecture	Clinical trials: Trial stages of medical devices, report writing, design and build project Tutorial: Group project
Week 8 : 15 July - 21 July	Lecture	Regulatory requirements, presentation, design and build project Tutorial: Group project
Week 9 : 22 July - 28 July	Lecture	Intellectual properties: IP strategy and patent search, design & build project Tutorial: Group project
Week 10 : 29 July - 4 August	Presentation	Presentation/Prototype showcase: Health technology assessment, group project presentation

Attendance Requirements

Please note that lecture recordings are not available for this course. Students are strongly encouraged to attend all classes and contact the Course Authority to make alternative arrangements for classes missed.

General Schedule Information

Lectures:

Wednesday 09:00 - 10:00, Mathews 310 (K-F23-310), Weeks 1-5, and 7-10

Tutorials:

Wednesday 10:00 - 12:00 Mathews 310 (K-F23-310), Weeks 1-5, and 7-10

Course Resources

Prescribed Resources

No specific textbooks are required for this course. Useful references will be listed on Moodle when required. Students seeking additional resources can also obtain assistance from the UNSW Library.

Recommended Resources

Medical Device Innovation Handbook by Durfee et al. Bakken Medical Devices Center, University of Minnesota, Minneapolis, USA

Course Evaluation and Development

Student feedback has helped to shape and develop this course, including feedback obtained from online evaluations as part of UNSW's myExperience process and UNSW Course Design Institute. Your feedback is much appreciated and taken very seriously. Continual improvements are made to the course based in part on such feedback and this helps us to improve the course for future students. Informal student feedback is also sought frequently throughout the semester and used to assist in the progression of the course.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Dr Dorna Esrafilzadeh		Room 1005, Level 1, Biological Sciences Building (E26), UNSW Sydney		Via email and for face-to-face consultation with pre-arrangement	No	No
Lecturer	Dr Ulises Aregueta Robles		Room 1001, Level 1, Biological Sciences Building (E26), UNSW Sydney		Via email and for face-to-face consultation with pre-arrangement	No	Yes
	Dr Jingjing Li					No	No
	Dr Dorna Esrafilzadeh		Room 1005, Level 1, Biological Sciences Building (E26), UNSW Sydney		Via email and for face-to-face consultation with pre-arrangement	No	No

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.