BIOM9561

Mechanical Properties of Biomaterials

Term 3, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Luca Modenese	l.modenese@unsw.edu.au	Available on appointment. Please book via email.	Biological Sciences South (E26), Office 1001	

School Contact Information

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

Course Details

Units of Credit 6

Summary of the Course

This course provides a theoretical and practical understanding of the mechanical properties of biomaterials. The course aims to present the fundamental relationships between the mechanical properties of a range of biomaterials and their biomedical applications.

Course Aims

The aims of this course are to:
- develop an understanding of the relationships between material properties and the biomedical applications of materials
- review several applications of materials and the principles that have led to the choice of those materials
- relate the properties and use of each type of material in the light of current clinical applications, to develop a deeper understanding of the field of biomaterials

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. have a broad understanding of fundamental mechanical principles as they relate to biomaterials	PE1.1, PE1.3
2. be able to discuss, develop and apply these mechanical principles to a range of biomaterials and medical applications.	PE2.1, PE3.2, PE1.5
3. critically review the literature in the area and apply knowledge gained from the course to analyse mechanical properties of biomaterials	PE1.4, PE2.1, PE2.2
4. clearly summarise and communicate findings from literature research using oral and written methods	PE1.4, PE3.2, PE3.4, PE3.6

Teaching Strategies

Each week there will be a 3 hour period comprising a lecture and, depending on the lecture content, small group exercises, group discussions and other methods to facilitate student learning. The lectures will examine the mechanical properties of biomaterials and will provide students with the basic knowledge to complete the assignments. There will be practical tutorials on computational biomechanics focusing on finite element modelling, intended as an opportunity for the student to familiarise with methods of mechanical evaluation of biomaterials in realistic applications.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Final Exam	35%	TBD	1, 2
2. Assignments on Computational Biomechanics	20%	TBD	1, 2
3. Course Assignments	25%	TBD	3
4. Group project and presentation	20%	TBD	3, 4

Assessment 1: Final Exam

Due date: TBD

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 you to review the entire course.

This is not a Turnitin assignment

Assessment 2: Assignments on Computational Biomechanics

Due date: TBD

These assigments consist of a set of problems to solve using methods from computational biomechanics, as demonstrated during the tutorials.

Assessment 3: Course Assignments

Due date: TBD

Five assignments related to the lectures contents will be provided and assessed through short quizzes at the end of the week.

Assessment 4: Group project and presentation

Due date: TBD

The objectives of the group project and presentation are to consolidate information learned in class and to develop literature research skills and skills relating to working in a group. Specific literature research skills developed and reinforced are critical review of the medical, scientific and engineering literature, communication of findings and application of knowledge from literature and course materials for analysing biomechanical applications.

Attendance Requirements

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

Course Schedule

View class timetable

Timetable

Date	Type	Content
Week 1: 12 September - 16 September	Lecture	Introduction to BIOM9561 Introduction to Biomaterials
Week 2: 19 September - 23 September	Lecture	Metals 1
Week 3: 26 September - 30 September	Lecture	Metals 2
Week 4: 3 October - 7 October	Lecture	Polymers
Week 5: 10 October - 14 October	Lecture	Ceramics
Week 6: 17 October - 21 October		
Week 7: 24 October - 28 October	Lecture	Composites
Week 8: 31 October - 4 November	Lecture	Biological Materials: Bone
Week 9: 7 November - 11 November	Lecture	Biological Materials: Soft Tissues
Week 10: 14 November - 18 November	Lecture	Final Presentation Day

Submission of Assessment Tasks

Laboratory reports and major assignments will require a Non Plagiarism Declaration Cover Sheet.

Assignments should be submitted on time. A daily penalty of 5% of the marks available for that assignment will apply for work received after the due date. Any assignment more than 5 days late will not be accepted. The only exemption will be when prior permission for late submission has been granted by the Course coordinator. Extensions will be granted only on medical or compassionate grounds under extreme circumstances.

Academic Honesty and Plagiarism

PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise will have their names entered on a plagiarism register and will be liable to disciplinary action, including exclusion from enrolment.

It is expected that all students must at all times submit their own work for assessment. Submitting the work or ideas of someone else without clearly acknowledging the source of borrowed material or ideas is plagiarism.

All assessments which you hand in must have a Non Plagiarism Declaration Cover Sheet. This is for both individual and group work. Attach it to your assignment before submitting it to the Course Coordinator or at the School Office.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:
https://student.unsw.edu.au/plagiarism

Academic Information

COURSE EVALUATION AND DEVELOPMENT
Student feedback has helped to shape and develop this course, including feedback obtained from on-line evaluations as part of UNSW's as part of UNSW's myExperience process. You are highly encouraged to complete such an on-line evaluation toward the end of Term. Feedback and suggestions provided will be important in improving the course for future students.

DATES TO NOTE
Refer to MyUNSW for Important Dates, available at:
https://my.unsw.edu.au/student/resources/KeyDates.html

ACADEMIC ADVICE
For information about:

- Notes on assessments and plagiarism,
- Special Considerations,
- School Student Ethics Officer, and
- BESS

refer to the School website available at
http://www.engineering.unsw.edu.au/biomedical-engineering/

Supplementary Examinations:

Supplementary Examinations for Term 1 2022 will be held on (TBC) should you be required to sit one.

This course outline sets out 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 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 (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Synergies in Sound 2016

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	
PE3.4 Professional use and management of information	✓
PE3.5 Orderly management of self, and professional conduct	
PE3.6 Effective team membership and team leadership	✓