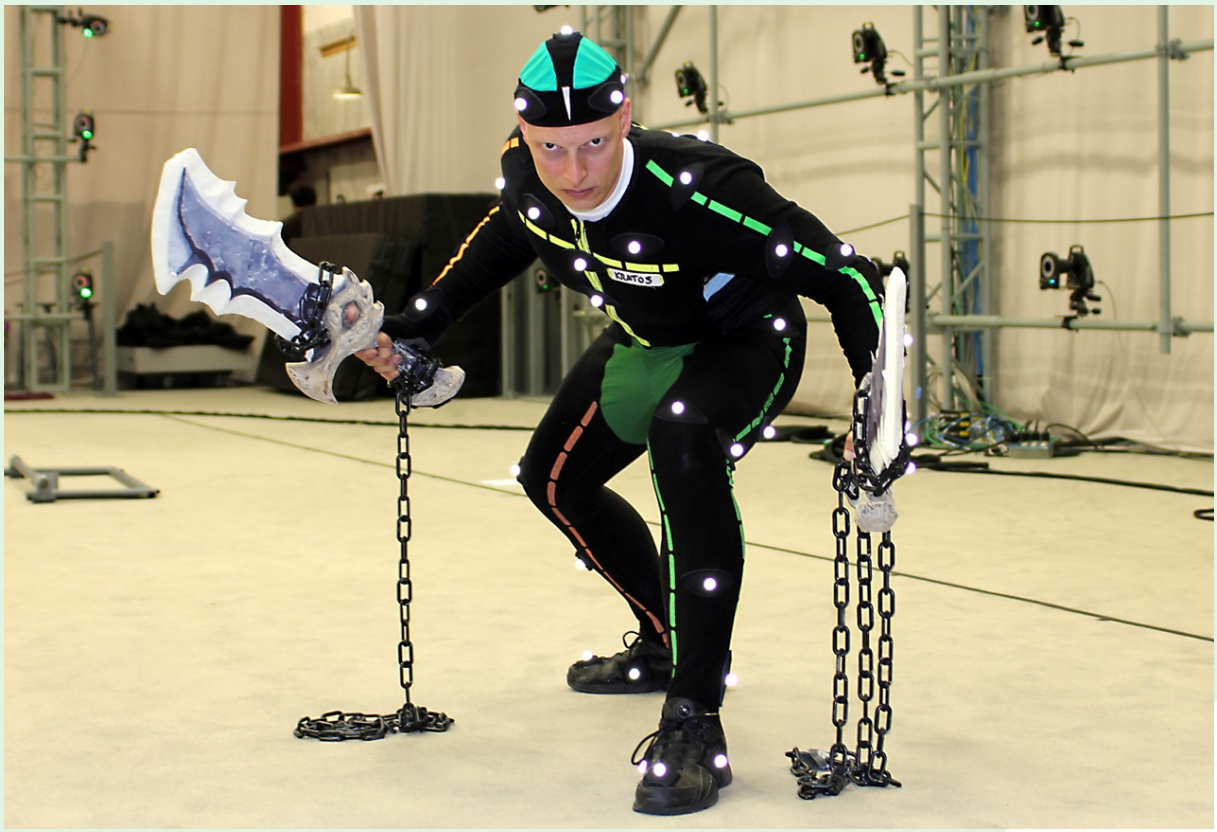
BIOM9541

Mechanics of the Human Body

Term 3, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Matthew Brodie	a.m.brodie@unsw.edu.au	Reach out by email to make an appointment about BIOM9541 or related thesis topics or use the BIOM9541 Moodle Discussion Board.	Samuels Building (F25) Room 515c	

Demonstrators

Name	Email	Availability	Location	Phone
Keng-Yin Lai	keng-yin.lai@unsw.edu.au	Keng-Yin provides dedicated support for remote learning students. Please reach out to Keng-Yin through the BIOM9541 Moodle Discussion Board.	Online support for "Flexible Learning"	
Astrid Crane	astrid.crane@student.unsw.edu.au	Astrid is the Tuesday session demonstrator. Please reach out to Astrid through the BIOM9541 Moodle Discussion Board.	Samuels Building (F25) Room 518	
Ray Gu	ray.gu@student.unsw.edu.au	Ray is the Wednesday session demonstrator. Please reach out to Ray through the BIOM9541 Moodle Discussion Board.	Samuels Building (F25) Room 518	

Name	Email	Availability	Location	Phone
Joshua Najdzion	j.najdzion@student.unsw.edu.au	Joshua is the Thursday session demonstrator. Please reach out to Joshua through the BIOM9541 Moodle Discussion Board.	Electrical Engineering (G03)	

School Contact Information

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

Course Details

Units of Credit 6

Summary of the Course

Ever wondered how Lord of the Rings or Avatar were created? How athletes might analyse the biomechanics of their movements to improve performance? Or about how advances in wearable technology, phone apps and smart garments can be used to detect, analyse and predict injuries and health issues or even help people with Parkinson's disease walk with confidence?

This course introduces students to the methods used in the analysis of human movement in medicine and health, including applications in sport biomechanics and musculoskeletal modelling. Methods to analyse body segment and joint kinematics, joint kinetics, work and power, muscle forces and associated energy cost will be covered.

Applications of biomechanics in clinical, occupational and recreational areas will be presented. Highlights include access to Neuroscience Research Australia's state-of-the-art 3D motion capture lab for the MoCap laboratory sessions. In case of COVID restrictions, illness or misadventure, options will be available for students to participant remotely with dedicated online support provided for 2022. Our focus is to offer the best possible learning and teaching experience with a focus on hands on and in-person learning experiences where possible.

Course Aims

The aims of this course are to:

1. Develop understanding of the field of human movement science and diverse applications in medicine, health and sport.
2. Introduce students to the fundamentals of anatomy and biomechanics.
3. Develop fundamental understanding of 3D motion capture, gait analysis and musculoskeletal modeling.
4. Introduce students to advances in wearable and mobile technologies for biomechanical analysis of human movement.
5. Enable students to critically apprise technologies used for biomechanical analysis of human movement.
6. Provide an engaging environment for students to self-organise their learning and develop team collaboration skills for engineering projects.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Analyse human movement using mechanical principles	PE1.1, PE1.2, PE1.3
2. Design and perform experiments that evaluate human movement	PE1.1, PE2.1, PE2.4, PE3.1, PE3.6
3. Critically analyse experimental outcomes in broader context	PE1.4, PE1.5, PE2.3

Learning Outcome	EA Stage 1 Competencies
4. Communicate experimental findings effectively using oral and written methods	PE2.1, PE3.2
5. Critically evaluate different types of wearable technologies used for analysing human movement	PE1.3, PE2.1, PE3.2
6. Engage in self learning practices and team collaboration to solve problems in biomechanics	PE2.2, PE2.4, PE3.1, PE3.3, PE3.5, PE3.6

OBJECTIVES

On completion of this course, you should:

- Have a broad understanding of the scope of biomechanics and its applications
- Understand the fundamental general mechanical principles used
- Be able to discuss, develop and apply mechanical principles to a range of problems and medical applications.
- Be able to describe and discuss the measurement, analysis and assessment of human movement.
- Critically review the literature in the area and apply knowledge gained from the course to analyse biomechanical applications
- Clearly summarise and communicate findings from literature research using oral and written methods.

Graduate attributes developed in this course include:

- The skills involved in scholarly inquiry
- An in-depth engagement with the relevant disciplinary knowledge in its inter-disciplinary context
- The capacity for analytical and critical thinking and for creative problem solving
- Information literacy – the skills to appropriately locate, evaluate and use relevant information
- An appreciation of and respect for diversity
- A capacity to contribute to and work within the international community
- The skills required for collaborative and multidisciplinary work
- A respect for ethical practice and social responsibility
- The skills of effective communication

Teaching Strategies

BIOM9541 Teaching and Learning uses many approaches to more effectively engage with students each week:

1. Online lectures: 1-hour self-paced lecture content delivered through Moodle;

2. Laboratory sessions: 2-hour face-to-face laboratory session (with onine options depending on COVID19 restrictions and health advice);

3. Free Discussions: the option to engage in several "Free Discussion" sessions with the teaching and learning team throughout the course;

4. Online Flexible Learning: for remote students there is also the choice of participating through "Online Flexible Learning" approaches, whereby students can submit Powerpoint demonstrations of their work instead of attending schedulled laboratory sessions and doing inperson/ZOOM demonstrations.

5. State-of-the-art Laboratories: BIOM9541 is excited to have access to Neurosicience Research Austrlia's (NeuRA) state-of-the-art 10-camera VICON 3D Motion Capture Lab. In T3, three face-to-face lab sesssions will be held at NeuRA a 5-minute walk from UNSW.

6. Beta-testing mobile technologies: BIOM9541 has also secured a beta testing licence for SPLYZA Motion an AI driven smart phone app for biomechanical analsysis of human motion. This provides additional flexibility for online students to conduct experiments in the comfort of their home environments.

7. Wearble technology will be used to investigate different ways to analyse human movement.

8. Fun Kahoot Quizzes that provide light-hearted repetition of key concepts that will help you cement the new knowledge and revise for the final exam.

Private Study	• Review lecture material and textbook • Do set problems and assignments • Join Moodle discussions of problems • Reflect on class problems and assignments • Download materials from Moodle • Keep up with notices and find out marks via Moodle
Online Lectures (self-paced learning)	• Find out what you must learn • See methods that are not in the textbook • Follow worked examples • Hear announcements on course changes
Software Laboratories	• Group collaboration and team work • Practice solving set problems • Ask questions
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding • Problem solving
MoCap Laboratory Work	• Hands-on work, to set studies in context • Group collaboration and team work
Feedback, reflection and discussion	• Online discussion forums • Post your feedback • Optional Free Discussion Sessions

Rationale: BIOM9541 teaching and learning content comprises a lecture and small group exercises, group discussions and other methods to facilitate student learning. The moodle lectures will examine the science and engineering involved in basic biomechanics and will provide students with the basic knowledge to solve the tutorial problems as well as complete the assignments. Lecture notes will be available via Moodle and feedback on laboratory work will be regularly provided to the students. Inaddition online and ZOOM help is available through several "Free Discussion" sessions run each week by the teaching and learning team. Key learning points each week will be reinforced through Kahoot

quizzes with incentives. Online help and class collaboration is further provided and encouraged to develop engineering leadership and teamwork skills.

Suggested approach to learning. This course requires you to understand the lecture material and then apply the knowledge to biomechanical applications. It is important to understand the fundamental concepts as soon as possible and to ask for help if you do not understand. Complete all the lectures and if something is unclear, please ask questions. Make sure you review lecture notes and read all material that is suggested or handed out. Class participation through attendance at tutorials, laboratories and group work is expected and will allow for alternative methods of absorbing the relevant information.

No previous biomechanics experience? Not a problem. As part of this course you also get access to an online Introductory Biomechanics course for your reference.

Additional Course Information

Biomechanics is the study of the effect of mechanical phenomena (forces, velocities, accelerations, energies, power, momenta, moments, friction, fatigue and failure) on human bodies. It relies on an understanding of mechanics and applies the fundamentals of mechanics to the structure and function of the human body.

Biomechanics is used in a diverse range of disciplines including biology, ergonomics, engineering, physiology, medicine, and mechanical physics. Many professionals – engineers, designers, physical therapists, oral and orthopaedic surgeons, cardiologists, and aerospace engineers – use practical applications of biomechanics.

Biomechanics has application in all areas of health care and medical problem solving that require physical manipulation. It may be the major area of concern in some instances (e.g. artificial joints, prosthetics and orthoses, mechanisms of physical injury) or it may be a vital adjunct to another area (e.g. design of an implantable pacemaker or specialist surgical tools).

This course covers in depth the methods used in the analysis of the biomechanics of the human musculoskeletal system. Methods to analyse body segment and joint kinematics, joint kinetics, work and power, muscle forces and associated energy costs will be covered. Applications of biomechanics in clinical, occupational and recreational areas will be presented.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Weekly Online Quizzes and Discussion Board Posts	10%	Weekly	1, 4, 6
2. OpenSim Model Demonstrations	10%	Weeks 1, 3, 4 & 7	1, 2, 4, 6
3. Industry Engagement and Mobile Technology Report	10%	Week 4	1, 2, 3, 4, 5, 6
4. Computational Laboratory Report	10%	Week 9	1, 4, 6
5. Individual Motion Capture Projects	30%	Weeks 6, 7 and 10	1, 2, 3, 4, 5, 6
6. Final Exam	30%	Exam Week	1, 2, 3, 4, 5

Assessment 1: Weekly Online Quizzes and Discussion Board Posts

Due date: Weekly

Weekly Progress (7%). The purpose is to ensure you are making timely progress through the online units. You will note that each online Moodle unit has a number of questions embedded throughout it. Your answers to these questions will be logged and recorded in the grade book. You will receive one credit (1%) for each unit if you complete with a score of at least 80% before your schedulled laboratory class of the same week (up to a maximum of 7 credits). It is expected that you complete the online Moodle unit before your laboratory session that week. You are then expected to enhance your learning experience by discussing the week's Moodle content with your demonstrator at the laboratory session.

Yay and Boo (3%) is a lighthearted assessment that will allow you to share your triumphs and failures with your colleagues by posting your results to the class Moodle forum. The purpose is to enhance BIOM9541 engagement. There will be three opportunities throughout the semester to participate in the Yay and Boo assessment. Yay and Boo opportunities will appear in three of the software laboratories (SL1, SL2 and SL3). You will be given the opportunity to share your triumph or failure with your colleagues on the discussion board. Each post published before the deadline will earn you one credit (1%). Don't miss out!

Assessment 2: OpenSim Model Demonstrations

Due date: Weeks 1, 3, 4 & 7

Attendance for all Software Laboratory sessions (SL1, SL2, SL3 and SL4) is compulsory. Failure to attend the laboratory class will mean that you cannot receive a grade for any of the assignments associated with this assessment component.

The four software laboratories provide you with an opportunity to analyse and simulate human

movement. You will be introduced to the analysis of human movement using OpenSim, a freely available software. You will use the 3D MoCap data you collect during the laboratory session at NeuRA in week 2 as well as sample data provided to perform various analyses of human movement. You will be assessed based on your model and your group responses.

The mark breakdown for each Software Laboratory (2.5%) will be as follows:

- **Model quality (1.5%)**
  - 0 for no model
  - 0.5 for working model with major errors
  - 1 for working model with minor errors
  - 1.5 for working model without errors

- **Group responses (1%)**
  - 0 for minimal effort
  - 0.5 for some effort, but more required
  - 1 for good effort (Note all group members will receive the same mark)

"Online Flexible Learning" Students will be required to submit through Moodle a working demo of thier model using Powerpoint instead of attending a session and will submit group reports to the dedicated online support demonstrator.

Assessment 3: Industry Engagement and Mobile Technology Report

Start date: Week 3
Due date: Week 4

Your team must **choose between** Beta testing the SPLZA motion app (Apple users only) **or** Investigating the accuracy of another health app (all phone users). Only one report per team is required and shoud focus on either:

Beta test the SPLYZA Motion (10%)
Students will beta test the SPLYZA Motion mobile phone app and produce a short report for SPLYZA. The app will be used to analyse the biomechanics of different sporting movements in the students home environment. The biomechanical analysis of different sports capture by the students' laboratory team can be compared and contrasted with what would be possible in NeuRA's state-of-the-art motion capture laboratory. A systems usibility scale (SUS) assessment should be carried out be each team member and the results complied. Students will be required to discuss the pitfalls and benfits of SPLYZA Motion and make recommendations to SPLYZA about the apps usability, bugs, potential uses, and priory improvements. A two to three page group report including images showing the analyses completed is required. The CEO of SPLYZA will mark your team reports. Teams without access to an iPhone can request to borrow one from Dr Matthew A. Brodie

Or:

Investigating the accuracy and usability of the ARGUS phone app or other health app (10%)
The ARGUS app was used to measure global activity levels in over 700,000 people as published in Nature. Resulting country by country step counts were compared to national obesity levels, but was the step counting app accurate? In your lab team you will test the ARGUS app or choose another similar health app to test. The team will be expected to develop and use appropriate scientific methods for app testing. A systems usibility scale (SUS) assessment should be carried out be each team member and

the results complied. Students will be required to discuss the pitfalls and benfits of their chosen health app and make recommendations to the app developers about the apps usability, bugs, potential uses, and priory improvements.A two to three page group report including images showing the analyses completed is required. Reports will be marked by Dr Matthew A. Brodie course coordinator of BIOM9541.

Assessment 4: Computational Laboratory Report

Due date: Week 9

Plotting MoCap Data and Calculations (10%). Here you will plot the data you collected during your laboratory class in week 2. You will then apply the theory of what you've learned in the 3D Kinematics unit to manually calculate joint centres, coordinate systems and joint angles from the data you collected during your laboratory class in week 2. You will be required to submit a report that includes MoCap data, plotted figures, calculations and results.

Assessment 5: Individual Motion Capture Projects

Start date: Week 5
Due date: Weeks 6, 7 and 10

Wearable technology project (10%). Based on the interactive experient and NeuRA titled "Texting is threatening" that looks at the risk of accidental falls while texting. You will use wearable technology to assess, how texting while walking may change a participant's gait pattern, cognitive processing speed and ability to recover and avoid hazards. Data of human movement will be collected using wearable technology in Week 5, which you will use to create and test a hypothesis of your own choosing. After your subsequent analysis, you will subit a 1-page scientific abstract on your findings in Week 6.

Individual Motion Capture Project (20%). You will design, perform and analyse a motion-capture experiment of your choosing, using a published research papers to guide your hypthesis. There are three assessment items that comprise this assessment item:

- **Proposal (5%).** The proposal is a short document that outlines your plans for your individual assignment (Week 7).
- **Presentation (5%).** You will give a three-minute peer-reviewed presentation (Week 10) using Powerpoint slides that contain an OpenSim model video of your experiment and the data you collected in Week 8.
- **Project data and outcomes (10%).** Based on your submitted powerpoint presentation slides, experimental data, OpenSim models, analysis and discussion, which aims to put your project in context of previous research (Week 10).

"Online Flexible Learning" students or those unable to attend NeuRA will have an option to use the SPLYYZA MOTION app (see Industrial Reports above) to conduct a home-based experiment instead or use existing data collected previously at NeuRA's motion capture laboratory.

Assessment 6: Final Exam

Due date: Exam Week

The final examination will be held online during the formal examination period. It will assess all content of

the course and will be open-book. You will be provided with an equation sheet during the exam, which will be made available to you well before to the exam so you know what to expect. Marks will be awarded for correct answers and for the quality of your working, which will have to be photographed and uploaded during the exam period. Practice exame questions will be released in Week 6.

Attendance Requirements

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

Course Schedule

Welcome to BIOM9541 Mechanics of the Human Body. We know it is still possible that there will be disruptions from COVID19 in T3 2022. The BIOM9541 team is dedicating to providing students with a world class, flexible and engaging learning experience. For students unable to attend face to face because of illness or other circumstances online options will be available.

Students are strongly encouraged to complete all learning activities on time and participate in all class discussions. Attendance at the tutorials and laboratories is compulsory. Non-attendance for reasons other than misadventure will preclude you from submitting the assignment related to the activity you missed. Your demonstrator will record attendance. Online students will have to submit a powerpoint demonstrations of their work to prove remote engagement.

Complete the onine modules before your lab sessions for credit and then ask questions during the lab sessions or using the discussion board to help you cement your new knowledge.

View class timetable

Timetable

Date	Type	Content
O-Week: 5 September - 9 September	Module	• Complete the Welcome & Introduction Module via Moodle • Get ahead by starting on the Gait Analysis Module
	Homework	• Join a Lab Team for either the Tuesday, Wednesday or Thursday weekly sessions at UNSW or join a "Flexisble Online Learning" Lab Team • Select a time slot for the Weeks 2, 5 and 8 MoCap Labs at NeuRA state-of-the-art facilities, don't miss out!
	Web	Please try to download OpenSim and other reccommended software early. It can take a couple of days to register and get the password for the download of OpenSim, so please get onto this task early. You will need to have access to OpenSim in Week 1 and it is a core software program BIOM9541. OpenSim is available on the SAM518 computers, but students that attend the Thursday laboratory session or online flexible learning students will need OpenSim on their laptops. We reccommend everyone downloads OpenSim.

Week 1: 12 September - 16 September	Module	Complete the Gait Analysis Module before your lab for credit
	Laboratory	Software Laboratory 1. Before this laboratory session, make sure you have access to the core biomechanical modelling software OpenSim.
	Homework	• Practice Question 1 • Select a time slot for the Weeks 2, 5 and 8 MoCap Labs at NeuRA state-of-the-art facilities, don't miss out!
	Assessment	• OpenSim SL1 Model and Team Report • Yay and Boo post 1
Week 2: 19 September - 23 September	Module	Complete Anthropometrics before your lab for credit
	Laboratory	Introduction to MoCap at NeuRA's state-of-the-art facilities. NeuRA policy currently requires proof of vaccination to attend onsite.
	Homework	Practice Question 2
	Assessment	Enjoy! No assessments in Week 2
Week 3: 26 September - 30 September	Module	Complete 3D Mathematics before your lab for credit
	Laboratory	Software Laboratory 2
	Homework	• Team beta testing of SPLYZA Motion or other Health App • Practice Question 3
	Assessment	• OpenSim SL2 Model and Team Report • Yay and Boo post 2
Week 4: 3 October - 7 October	Module	Complete Introduction to Wearable Technology before your lab for credit
	Laboratory	Software Laboratory 3
	Assessment	• OpenSim SL3 Model and Team Report • Team report for Beta testing SPLYZA Motion or other Health App
Week 5: 10 October - 14 October	Module	Complete Advanced Wearable Technology before your lab for credit
	Laboratory	"Texting is threatening" investigates why texting while walking may cause accidents and uses wearable techonology at NeuRA.
	Assessment	Enjoy! No assessments in Week 5

Week 6: 17 October - 21 October	Module	Flex Week - No new content!
	Assessment	• Individual MoCap Report for "Texting is threatening" • Yay and Boo post 3
Week 7: 24 October - 28 October	Module	Complete 3D Kinematics before your lab for credit
	Homework	Practice Question 4
	Laboratory	Software Laboratory 4
	Assessment	• OpenSim SL4 Model and Team Report • Individual MoCap Project, submit your proposal for your Week 8 experiment at NeuRA's state-of-the-art MoCap lab.
Week 8: 31 October - 4 November	Laboratory	Individual MoCap Project at NeuRA's state-of-the-art MoCap Lab. Online flexible students may conduct an experiment in the home environment using SPLYZA motion, submit a proposal for another team to complete, or combine data from several pre-recorded experiments to come up with an new hypothesis to test.
	Module	Complete 3D Kinetics before your lab for credit
	Homework	Practice Question 5
	Assessment	Enjoy! No assessments in Week 8
Week 9: 7 November - 11 November	Module	Complete Muscle Mechanics before your lab for credit
	Laboratory	Computational Laboratory
	Homework	Practice Question 6
	Assessment	Computational Laboratory Indvidual Report
Week 10: 14 November - 18 November	Module	Complete Musculoskeletal Modelling before your lab for credit
	Laboratory	Presentation of your Individual MoCap Project (from Week 8) using Power Point slides (you will be marked by your peers). Online Flexible Learning students will be required to submit a recorded video presentation.
	Assessment	Individual MoCap Project (from Week 8) data, OpenSim models, results, discussion and Power Point slides.

Resources

Prescribed Resources

Online Flexible Learniung students and Thursday Laboratory students should bring their own laptop computer to Software and Computational Laboratories with OpenSim and other core software installed. OpenSim and other core software is available on the SAM518 computers and these will be used for the Tuesday and Wednesday laboratory sessions.

Recommended Resources

The recommended background text for this course are:

- Robertson, D.G.E. et al. Research methods in biomechanics. First (or second) edition, Human Kinetics, 2004 (or 2016).
- Winter, D.A. Biomechanics and motor control of human movement. Third edition, John Wiley & Sons, Inc., 2005.

Other useful reference books that are held in the UNSW Library are:

- Enderle, J.D. and J.D. Bronzino, Introduction to biomedical engineering, Third edition, Academic Press, 2012.
- Meriam, J.L. and L.G. Kraige, Engineering mechanics, Sixth edition, John Wiley & Sons, 2008.

Students seeking additional resources can also obtain assistance from the UNSW Library at **http://library.unsw.edu.au/**.

Additional readings and recommended websites will be listed on Moodle when required.

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 myExperience process. 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.

Laboratory Workshop Information

Students will be required to sign COVID19 safe declarations before attending any face-to-face laboratory sessions at NeuRA's state-of-the-art MoCap lab, which includes evidence of vaccination.

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

Joseph Gatt as "Kratos" on the set of "God of War: Ascension". Posted on behalf of Joseph Gatt. This image is free to use under the Creative Commons Attribution-Share Alike 3.0 Unported license.

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	✓