

HESC2451

Biomechanics

Course Outline
Term 1, 2021

School of Health Sciences
Faculty of Medicine & Health

Table of Contents

1. Staff	3
2. Course information	3
2.1. Course summary	3
2.2. Course aims	4
2.3. Course learning outcomes (CLO)	4
2.4. Relationship between course and program learning outcomes and assessments	4
3. Strategies and approaches to learning	5
3.1. Learning and teaching activities	5
3.2. Expectations of students	5
4. Course schedule and structure	6
5. Assessment	6
5.1. Assessment tasks	6
5.2. Submission of assessment tasks	7
5.3. Feedback on assessment	7
6. Academic integrity, referencing and plagiarism	8
7. Readings and resources	8
8. Administrative matters	8
9. Additional support for students	8

1. Staff

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor	Kirsty McDonald	kirsty.mcdonald@unsw.edu.au	By Appointment	Office: Rm 205, Wallace Wurth Building
Course Convenor	Jeanette Thom	j.thom@unsw.edu.au	By Appointment	Office: Rm 220, Wallace Wurth Building
Tutors	Key Nahan			

2. Course information

Units of credit: 6

Pre-requisite(s): N/A

Teaching times and locations: <http://timetable.unsw.edu.au/2022/HESC2451.html>

Lectures: Online

Laboratories: Thursday 9 AM – 11 AM
Thursday 11 AM – 1 PM
Thursday 2 PM – 4 PM
Thursday 4 PM – 6 PM
Friday 9 AM – 11 AM

Tutorials: Tuesday 10 AM – 11 AM
Tuesday 11 AM – 12 PM
Wednesday 10 AM – 11 AM
Wednesday 11 AM – 12 PM
Wednesday 12 PM – 1 PM

2.1. Course summary

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

Knowledge of biomechanics is used in a diverse range of disciplines including biology, ergonomics, engineering, physiology, medicine, and exercise science. Many professionals—engineers, designers, physical therapists, exercise physiologists, 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 which 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., development and evaluation of rehabilitation protocols).

HESC2451 is an introductory course and is organised to cover introductory information on human anatomy and fundamental mechanics. This knowledge will then be applied to the analysis of the human body as a system in order to understand the resultant impacts of motion or motions.

2.2. Course aims

The aims of this course are to:

- Introduce students to the fundamentals of biomechanics.
- Relate these to the mechanical actions of, by, and on the body by integrating the knowledge of anatomy and mechanics to develop a deeper understanding of the field of human movement science.

2.3. Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

1. Explain how basic physical principles apply to human motion and the mechanical properties of musculoskeletal tissues.
2. Describe how biomechanics fits within the interdisciplinary context of movement science and can inform health and exercise science practice.
3. Demonstrate problem solving and critical thinking abilities in relation to human motion and effects of load on the musculoskeletal system.
4. Work collaboratively in a team to collect and interpret biomechanical data.

2.4. Relationship between course and program learning outcomes and assessments

Course Learning Outcome (CLO)	LO Statement	Related Tasks & Assessment
CLO 1	Explain how basic physical principles apply to human motion and the mechanical properties of musculoskeletal tissues.	Weekly Progress Marks Lab Assessments Test Exam
CLO 2	Describe how biomechanics fits within the interdisciplinary context of movement science and can inform health and exercise science practice.	Weekly Progress Marks Lab Assessments Test Exam
CLO 3	Demonstrate problem solving and critical thinking abilities in relation to	Weekly Progress Marks

	human motion and effects of load on the musculoskeletal system.	Lab Assessments Test Exam
CLO 4	Work collaboratively in a team to collect and interpret biomechanical data.	Lab Assessments

3. Strategies and approaches to learning

3.1. Learning and teaching activities

Lectures will be delivered online and include concept development, problem solving and discussion elements. Laboratories are designed to demonstrate a practical application of lecture content. Classes will cover the theory supporting experimental methods and the practical research problems. Tutorials are designed to facilitate discussion about course content, address any student questions, and provide an opportunity for students to practice math-based problems. These strategies are intended to support students in attaining the learning outcomes. Content, including notes and videos, will be available via Moodle. Assessments and feedback on work will be provided to students regularly.

This course requires students to understand the lecture material and then apply the knowledge to basic biomechanical applications. It is important that students learn the fundamental concepts as soon as possible and ask for help as required. Students are expected to review lecture notes and read all material that is suggested. Class participation through attendance at exercises and group work is expected and will allow for alternative methods of absorbing the relevant information.

3.2. Expectations of students

Students are reminded that UNSW recommends that a 6 units-of-credit course should involve about 150 hours of study and learning activities. The formal learning activities total approximately 50 hours throughout the term and students are expected (and strongly recommended) to do at least the same number of hours of additional study.

Students are expected to complete the online lectures (self-paced) by the end of each week. It is a requirement of this course that students attend at least five laboratory classes. Attendance at tutorials highly recommended, though not compulsory.

4. Course schedule and structure

This course consists of 1-3 hours of class contact per week.

Week	Lectures <i>Self-paced</i>	Laboratory classes <i>In-person classes</i>	Tutorial classes <i>Online/in-person classes</i>	Assessment* <i>See Assessment section for more information</i>
1	Welcome Math revision Linear kinematics	Linear kinematics	Linear kinematics	WPM Quiz (2%)
2	Angular kinematics	Angular kinematics	Angular kinematics	WPM Quiz (2%)
3	Linear kinetics	Linear kinetics	Linear kinetics	WPM Quiz (2%) Lab Assessment I (12%)
4	Static equilibrium	Static equilibrium	Static equilibrium	WPM Quiz (2%)
5	Angular kinetics		Angular kinetics	WPM Quiz (2%) Test (18%)
6				
7	Impulse and momentum	Impulse and momentum	Impulse and momentum	WPM Quiz (2%)
8	Tissue mechanics	Tissue mechanics	Tissue mechanics	WPM Quiz (2%) Lab Assessment II (12%)
9	Work, energy and power	Work, energy and power <i>Thursday classes only</i>	Work, energy and power	WPM Quiz (2%)
10	Fluid mechanics	Work, energy and power <i>Friday class only</i>	Fluid mechanics	WPM Quiz (2%)
Exam Period				Exam (40%)

*WPM = Weekly Progress Marks

Exam Period: 29 April – 12 May

Supplementary Exam Period: 23 May – 27 May

5. Assessment

5.1. Assessment tasks

All assessments in this course are individual assessments.

The Weekly Progress Marks are designed to encourage students to engage with the online lecture modules. They ensure students progress through the course in a timely manner. Nine short quizzes, each worth 2%, will assess content from the corresponding weekly lecture. Students will have one attempt to complete the quiz with no time limit on the attempt prior to the deadline. Feedback on questions is generated automatically and provided to students after the quiz deadline has passed.

The Lab Assessment requires students to compile and submit their responses to a series of questions from the lab classes. Lab classes provide an opportunity for students to apply their theoretical knowledge of biomechanics to a practical scenario. By conducting lab-based experiments in small groups, students also gain experience in collecting, processing and analysing data. While students may collaborate to collect data, and discuss their approaches to the assessment questions, all submitted answers must be entirely the work of the individual student. These assessments require students to present and discuss their findings from a small sample of lab classes (e.g., Assessment I will cover content from classes 1-2). Students will receive feedback in the form of a grading rubric, with additional comments provided where applicable.

Students will take a written Test approximately halfway through the term. Assessment content will include lectures, laboratories and tutorials. Similar to the format of the Final Exam, the Test provides

an opportunity for students to apply their knowledge and problem-solving skills to answer calculation-based questions. A grade will be provided for each question and specific written feedback will be included where applicable.

The written Exam will be undertaken during the UNSW exam period. All course content can be assessed. The Exam provides an opportunity for students to apply their knowledge and problem-solving skills to answer calculation-based questions.

Assessment task	Length	Weight	Due date and time
Weekly Progress Mark Quizzes	Self-paced	2% each (18% total)	Friday at 4 PM W1-5, 7-10
Lab Assessments	Self-paced	12% each (24% total)	Thursday at 4 PM W3, 8
Test	60 mins	18%	Monday at 3 PM W5
Exam	2 hours 10 mins	40%	Exam period

Further information

UNSW grading system: <https://student.unsw.edu.au/grades>

UNSW assessment policy: <https://student.unsw.edu.au/assessment>

5.2. Submission of assessment tasks

Late Submission

Late submissions will be penalized at 5% per day. Submissions received after 5 days (120 hours) will receive zero marks. Please note that late submission guidelines are only applicable to the Lab Assessments. If you are unable to complete the Weekly Progress Mark Quizzes, the Test or the Exam within the prescribed timeframes, you must apply for Special Consideration (see below). You should note that by starting the quiz/test/exam you are acknowledging that you are Fit to Sit/Submit and cannot apply for Special Consideration later.

Special Consideration

If you experience a short-term event beyond your control (exceptional circumstances) that impacts your performance in a particular assessment task, you can apply for Special Considerations.

You must apply for Special Consideration **before** the start of your exam or due date for your assessment, except where your circumstances of illness or misadventure stop you from doing so.

If your circumstances stop you from applying before your exam or assessment due date, you must **apply within 3 working days** of the assessment, or the period covered by your supporting documentation.

More information can be found on the [Special Consideration website](#).

5.3. Feedback on assessment

Feedback for Weekly Progress Mark Quizzes is automatically generated based on the answers you provide. The correct solution will be displayed but you will not see the working. This is an opportunity for students to attempt the question as a form of revision for future assessments.

Feedback for Lab Assessments will occur via a marking rubric. Should students want to individually discuss their submission, they can also book an appointment to speak with course staff.

Students will receive a grade for their Test and teaching staff will reference the content of the Test in the tutorial that occurs after all students have received their grade. Students are invited to review their Test and must do so by arranging an appointment with course staff.

No feedback will be available for the Exam, other than a final grade.

6. Academic integrity, referencing and plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at <https://student.unsw.edu.au/referencing>

***Academic integrity** is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage.¹ At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.*

Further information about academic integrity and **plagiarism** can be located at:

- The Current Students site <https://student.unsw.edu.au/plagiarism>, and
- The ELISE training site <http://subjectguides.library.unsw.edu.au/elise/presenting>

The Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>.

7. Readings and resources

Relevant Textbook: [Hamill, J., Knutzen, K., Derrick, T., Biomechanical Basis of Human Movement, 4th Edition. Lippincott Williams and Wilkins, 2014.](#)

8. Administrative matters

Student enquiries should be submitted via student portal <https://portal.insight.unsw.edu.au/web-forms/>

9. Additional support for students

- The Current Students Gateway: <https://student.unsw.edu.au/>
- Academic Skills and Support: <https://student.unsw.edu.au/academic-skills>
- Student Wellbeing and Health <https://www.student.unsw.edu.au/wellbeing>
- UNSW IT Service Centre: <https://www.myit.unsw.edu.au/services/students>
- UNSW Student Life Hub: <https://student.unsw.edu.au/hub#main-content>

¹ International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

- *Student Support and Development:* <https://student.unsw.edu.au/support>
- *IT, eLearning and Apps:* <https://student.unsw.edu.au/elearning>
- *Student Support and Success Advisors:* <https://student.unsw.edu.au/advisors>
- *Equitable Learning Services (Formerly Disability Support Unit):* <https://student.unsw.edu.au/els>
- *Transitioning to Online Learning* <https://www.covid19studyonline.unsw.edu.au/>
- *Guide to Online Study* <https://student.unsw.edu.au/online-study>