Faculty of Medicine & Health
School of Health Sciences

HESC2451

Biomechanics

COURSE OUTLINE

Term 1, 2021

CRICOS Provider Code 00098G

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Please read this manual/outline in conjunction with the following pages on the School of Medical Sciences website:

- Advice for Students
- Learning Resources

(or see "STUDENTS" tab at medicalsciences.med.unsw.edu.au)

Staff Contact Details

Convenors:	Kirsty McDonald Office: Rm 205, Wallace Wurth	kirsty.mcdonald@unsw.edu.au
Demonstrators:	*TBA*	
Program Officer:	Ina Ismail	UNSW Student Portal Web Forms http://unsw.to/webforms

Course Details

Units of Credit	6			
Contact Hours	2 hours/week, plus an additional 1 hour/week in weeks 4 and 8			
Lectures	Online			
Laboratory Classes	One of the following:			
	Day	***Time***	***Location***	***Weeks***
	Thursday	09:00 - 11:00	Rm 120, Wallace Wurth	1-5, 7-9
	Thursday	11:00 - 13:00	Rm 120, Wallace Wurth	1-5, 7-9
	Thursday	13:00 - 15:00	Rm 120, Wallace Wurth	1-5, 7-9
	Thursday	15:00 - 17:00	Rm 120, Wallace Wurth	1-5, 7-9
Tests	Friday	13:00 – 14:00	CLB6/CLB8 (see timetable)	4, 8
Office Hours (optional)	Friday	13:00 – 14:00	Online	1-3, 5, 9-10

Course Description

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.

Student Learning Outcomes

The aims of this course are to:

- Introduce students to the fundamentals of biomechanics; and
- 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.

On completion of this course, students should be able to:

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

Course Program

Week	Lectures (To be completed on a weekly basis in the student's own time)	Laboratory classes (In-person classes)	Assessment (See Assessment section for more information)	Extra learning resources (Optional)
Ongoing			Weekly Progress Marks	
1	Welcome Linear kinematics	LAB 1: Linear kinematics		Math revision module
2	Angular kinematics	LAB 2: Angular kinematics	Lab Assessment I	
3	Linear kinetics	LAB 3: Linear kinetics		
4	Static equilibrium	LAB 4: Static equilibrium	TEST 1	Practice test
5	Angular kinetics	LAB 5: Angular kinetics	Lab Assessment II	
6				
7	Impulse and momentum	LAB 6: Impulse and momentum		
8	Power, work, energy	LAB 7: Power, work, energy	TEST 2	Practice test
9	Tissue mechanics	LAB 8: Tissue mechanics	Lab Assessment III	
10	Fluid mechanics			
Exam Period			EXAM (40%)	Practice exam

Final exam period for Term 1, 2021 is April 30 – May 13.
Supplementary exam period for Term 1, 2021 is May 24 – May 28.

Teaching Strategies

Lectures will be delivered online and include concept development, problem solving and discussion elements. These will cover the theory supporting experimental methods and the practical research problems. Laboratories are designed to facilitate discussion about course content, address any student questions, and explain the concepts using practical approaches. 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.

Suggested Approach to Learning

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.

Course Resources

See also Learning Resources on the SoMS website.

Relevant Textbooks

- Hamill, J., Knutzen, K., Derrick, T., Biomechanical Basis of Human Movement, 4th Edition. Lippincott Williams and Wilkins, 2014.

UNSW Learning Centre

The Learning Centre offers academic skills support to all students across all years of study enrolled at UNSW. This includes assistance to improve writing skills and approaches to teamwork. See www.lc.unsw.edu.au

Additional Resources

Students seeking additional resources can also obtain assistance from the UNSW Library. Relevant professional societies include:

- Exercise and Sports Science Australia (www.essa.org.au)
- Australian and New Zealand Society of Biomechanics (www.anzsb.asn.au)
- International Society of Biomechanics (www.isbweb.org)

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. Student 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 term and used to assist in the progression of the course.

Assessments

Week	Task	Assessable content	% of total mark	Due date
Ongoing	Weekly Progress Marks	You will receive 1.11% for this task if you complete the weekly lecture modules on time and score at least 80% in the relevant lecture quiz. Failure to do so will result in a score of 0% for a given week.	10	Friday of each week, 17:00
1				
2	Lab Assessment	Lab Assessment I (Material from LABS 1-2)	10	Friday Week 2, 17:00
3				
4	**TEST 1**	Material from Weeks 1-3	10	Friday Week 4, 13:00-14:00
5	Lab Assessment	Lab Assessment II (Material from LABS 3-5)	10	Friday Week 5, 17:00
6				
7				
8	**TEST 2**	Material from Weeks 4-8	10	Friday Week 8, 13:00-14:00
9	Lab Assessment	Lab Assessment III (Material from LABS 6-8)	10	Friday Week 9, 17:00
10				
Exam Period	**EXAM**	**All course material**	**40**	

Task	Combined % of total mark
Weekly Progress Marks	10
Lab Assessments	30
Tests	20
Exam	40

Submission time (hours after deadline)	Late submission penalty (% of grade)
<24	50
24-48	75
>48	100

General Information

Official Communication

All communication will be via official UNSW email, please see Advice for Student-Official Communication for more details.

Academic Integrity and Plagiarism

Plagiarism is using the words or ideas of others and presenting them as your own. Plagiarism is a type of intellectual theft and is regarded by the university as academic misconduct. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. The University has adopted an educative approach to plagiarism and has developed a range of resources to support students.

The UNSW Student Code outlines the standard of conduct expected of students with respect to their academic integrity and plagiarism. More details of what constitutes plagiarism can be found here.

Attendance Requirements

Attendance at laboratory classes is compulsory. Non-attendance for reasons other than illness, misadventure, or other circumstances beyond the student's control (as approved by the course convenor) will **result in an automatic 5% reduction in the student's final course grade**. Arriving more than 15 minutes after the start of class will be recorded as non-attendance by the demonstrator. It is **the responsibility of the student** to make sure their attendance has been registered, and no discussions will be entered into after the completion of the class. If absent for medical reasons, a medical certificate must be lodged with the convenor within seven days. No consideration will be given after this time except for truly exceptional circumstances.

If a laboratory class has been missed, it is the responsibility of the student to source a dataset to complete the associated assessment (as required).

For additional details on the UNSW Policy on Class Attendance and Absence see Policy on Class Attendance and Absence.

Special Consideration

Please see UNSW-Special Consideration. If student performance in a course, either during session or in an examination, has been adversely affected by illness, misadventure, or other circumstances beyond the student's control, the student is encouraged to apply for special consideration online. More information about Special Consideration can be found here: https://student.unsw.edu.au/special-consideration.

If a request for consideration is granted, an alternative assessment will be organised which may take the form of a supplementary exam, increased weighting of the final exam, or an oral element. Students cannot assume they will be granted supplementary assessment.

For the UNSW assessment information and policy, see:
https://my.unsw.edu.au/student/academiclife/assessment/AssessmentPolicyNew.html

https://student.unsw.edu.au/assessment

Health and Safety

Class activities must comply with the NSW *Work Health and Safety Act 2011*, the *Work Health and Safety Regulation 2017*, and other relevant legislation and industry standards. It is expected that students will conduct themselves in an appropriate and responsible manner in order not to breach HS regulations and ensure a safe work/study environment for themselves and others. Further information on relevant HS policies and expectations is outlined at: www.safety.unsw.edu.au.

Student Conduct

*A*ll students must accept their shared responsibility for maintaining a safe, harmonious and tolerant University environment.
For further information *see* www.student.unsw.edu.au/conduct.

Student Equity and Diversity Issues

Students requiring assistance are encouraged to discuss their needs with the course convenor prior, or at the commencement of the course, or with staff in the Equitable Learning Services (previously known as SEADU) (9385 4734). Further information for students with disabilities is available at https://student.unsw.edu.au/els.

Student Support Services

Details of the available student support services can be found at Educational Support Services.

Details of counselling support services can be found at Counselling and Psychological Services.

Appeal Procedures

Details can be found at Student Complaints and Appeals.