Faculty of Medicine
School of Medical Sciences

BIOM2451

Biomechanics for Sports Scientists

COURSE OUTLINE

Term 1, 2020

CRICOS Provider Code 00098G

CONTENTS PAGE

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

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Course details

Units of Credit	6			
Contact Hours	2 hours/week, plus an additional 1 hour/week in weeks 4, 7 and 10			
Lectures	Online via Moodle			
Tutorial/Laboratory	One of the following:			
	Mon	11AM – 1PM	Wks 2-8, 10-11	Matthews 102
	Mon	1PM – 3PM	Wks 2-8, 10-11	Morven Brown LG30
	Wed	10AM – 12PM	Wks 2-10	Squarehouse 214
	Wed	12PM – 2PM	Wks 2-10	Squarehouse 205
	Thurs	10AM – 12PM	Wks 2-10	AGSM LG06

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 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).
BIOM2451 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 you 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, you should be able to:

- Explain how basic physical principles apply to human motion;
- Undertake simple analyses of human motion;
- Analyse the effects of loads applied to the musculoskeletal system;
- Describe the mechanical properties of the musculoskeletal system; and
- Explain how biomechanics can inform health and exercise science practice.

Graduate attributes developed in this course include:

- Understanding of their discipline in its interdisciplinary context
- Rigorous in their analysis, critique and reflection
- Able to apply their knowledge and skills to solving problems
- Collaborative team workers

Course Program

Wk	Block	Lectures **Online via Moodle** *(Due before lab class of following week)*	Tutorials **Own time** *(Question time during class of following week)*	Practical **During the laboratory period** *(Lab report due before lab class in week indicated in Assessment column)*	Assessment (see relevant section)
1	Block 1 Statics	Welcome Math revision Forces	Math revision Forces	No practical	
2		Moments	Moments	P1 A) Forces B) Friction	
3		Static equilibrium	Static equilibrium	P2 Moments	P1 report
4		Mechanics of materials	Mechanics of materials	P3 Static Equilibrium	**Block test 1** P2 report
5	Block 2 Kinematics	Linear kinematics Projectile motion	Linear kinematics Projectile motion	P4 Mechanics of materials	P3 report
6		Angular kinematics	Angular kinematics	P5 Linear kinematics P6 Projectile motion	P4 report
7	Block 3 Kinetics	Linear kinetics Angular kinetics	Linear kinetics Angular kinetics	P7 Angular kinematics	**Block test 2** P5 report P6 report
8		Impulse-momentum	Impulse-momentum	P8 Linear kinetics P9 Angular kinetics	P7 report
9		Work, energy and power	Work, energy and power	P10 Impulse-momentum (Monday classes will not run due to public holiday)	P8 report P9 report
10		Fluid mechanics	Fluid mechanics	P10 Impulse-momentum (Monday classes only) P11 Work, energy and power	**Block test 3** P10 report P11 report (in class)
11		No lecture	No tutorial	P11 Work, energy and power (Monday classes only)	P11 report (in class)

Assessments must be submitted in soft-copy via Moodle.

Final exam period for Term 1, 2020 is Sat 2 May to Friday 15 May 2020.
Supplementary exam period for Term 1, 2020 is Mon 25 May to Fri 29 May 2020.

Teaching Strategies

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 Lecturers	• Find out what you must learn • See methods that are not in the textbook • Follow worked examples • Hear announcements on course changes
Tutorials	• Be guided by demonstrators • Practice solving set problems • Ask questions
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving
Laboratory Work	• Hands-on work to set studies in context

Lectures will be delivered online and include concept development, problem solving and discussion sessions. These will cover the theory supporting experimental methods and the practical research problems. Laboratories (one per week) are designed to review tutorial problems (it is expected that you will have attempted the tutorial questions prior to the tutorial) and explain the concepts using practical approaches. These strategies are intended to support you in attaining the learning outcomes. Content, including notes and videos, will be available via Moodle. Assessments and feedback on tutorial work will be provided to you regularly.

Suggested Approach to Learning

This course requires you to understand the lecture material and then apply the knowledge to basic 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 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

- Watkins, J., An introduction biomechanics of sport and exercise. Churchill Livingstone Elsevier, 2007.
- Hall, S.J., Basic biomechanics, Sixth edition, McGraw Hill, 2012.

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

Assessment

Task	Knowledge & Abilities Assessed	Assessment Criteria	% of Total Mark	Date
Weekly progress marks will ensure you are keeping up with content. The online content contains checkpoint questions to allow you to gauge your understanding. There are a variety of question types such as comprehension, true/false, multiple-choice and short answer. You can attempt the questions multiple times. Your highest mark will be recorded in the Gradebook.	Weekly lecture topic	Completion Note: you will receive 100% for this task if you complete at least ten topics on time and score at least 85%. Submitting fewer than ten will result in a score of 0.	10	Continuous
Block test 1 is made up of five multiple- choice questions of equal weighting, and one to two calculation-based questions.	Statics: Topics included in test: Math Revision, Forces, Moments, Static Equilibrium Lectures/Tutes: Wks 1-3 Pracs: P1-3	Ability to solve problems of static equilibrium.	8	9 March
Block test 2 is made up of five multiple- choice questions of equal weighting, and one to two calculation-based questions.	Kinematics: Topics included in test: Linear Kinematics, Projectile Motion, Angular Kinematics Lectures/Tutes: Wks 5 & 6 Pracs: P4-6	Ability to solve problems pertaining to linear and angular kinematics.	8	30 March
Block test 3 is made up of five multiple- choice questions of equal weighting, and one to two calculation-based questions.	Kinetics: Topics included in test: Linear kinetics, angular kinetics, impulse-momentum Lectures/Tutes: Wks 7-8 Pracs: P7-9	Ability to solve problems pertaining to linear kinetics, angular kinetics, and impulse- momentum.	8	20 April
Practical activity reports are due before your next class, one week after the practical activity is conducted, except for P11 which will be due at the end of the class. Submission is online. Each practical activity should provide you with real world and relevant illustrations of the content you have learned.	All topics, one at a time, as well as data collection, manipulation and interpretation.	As with the progress marks, you must submit all reports on time to be awarded marks for this component of the course. However, there is no minimum mark requirement. Each report is marked out of 100. The final mark for this component will be a weighted sum of all the individual reports.	16	Continuous
Final Examination	All lectures, tutorials and practical activities.	Application and discussion of concepts learned throughout the term.	50	TBA

Late submissions will be penalized at a rate of 10% per day after the due time and date has expired.

General Information

Official Communication

All communication will be via your 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 the practical activities is compulsory. Non-attendance for reasons other than misadventure will preclude you from submitting the activity related to the activity you missed. Your demonstrator will record attendance. Tutorials are designed to review problems distributed online, and it is expected that you will have attempted these questions prior to attending the tutorial.

If absent for medical reasons, a medical certificate must be lodged with the convenor within seven days of the time period of the certificate's expiry. No consideration will be given after this time except for truly exceptional circumstances. Arrival more than 15 minutes after the start of the class will be recorded as non-attendance. Although lecture recordings will be available, student participation is encouraged in the lectures and these are important to attend.

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 you believe that your performance in a course, either during session or in an examination, has been adversely affected by sickness, misadventure, or other circumstances beyond your control, you can apply for special consideration online. For more information about Special Consideration, please follow this link: https://student.unsw.edu.au/special-consideration.

If your 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. You cannot assume you 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.