UNSW SYDNEY | Australia's Global University

Graduate School of Biomedical Engineering

# Course Outline

Term 2 2020

# BIOM9551

# BIOMECHANICS OF PHYSICAL REHABILITATION

# Contents

# 1. Staff contact details

**Contact details and consultation times for course convenor**

Name: A/Prof Lauren Kark
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Please contact Lauren via email or Teams.

**Contact details and consultation times for additional lecturers/demonstrators/lab staff**

Name: Lauren Wood
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Please contact Lauren and Gabo via Teams.

# 2. Important links

- Moodle
- Health and Safety
- Student Resources
- UNSW Timetable
- UNSW Handbook
- Engineering Student Support Services Centre
- UNSW Graduate School of Biomedical Engineering

# 3. Course details

**Credit points**

This is a 6 unit-of-credit (UoC) course and involves 3 hours per week (h/w) of face-to-face contact.

The normal workload expectations of a student are approximately 25 hours per term for each UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

You should aim to spend about 15 h/w on this course. The additional time should be spent in making sure that you understand the lecture material, completing the assignments, and further reading.

**Contact hours**

| | Day | Time | Location |
|---|---|---|---|
| **Lectures** | Any | Any | Moodle |
| | | | |
| **Laboratories** | Monday | 10am – 1pm | Teams |
| | Monday | 2 – 5pm | Teams |
| | Friday | 9am – 12pm | Teams |
| | Friday | 1 – 4pm | Teams |

Please refer to your class timetable for the learning activities you are enrolled in and attend only those classes.

**Summary and aims of the course**

The handbook entry for BIOM9551 Biomechanics of Physical Rehabilitation can be found here.

Rehabilitation is a broad area of health-related activity involving medicine, allied health and engineering. Rehabilitation activities include assessment of an individual's physical capacity, assessment of work demands or activities of daily living, methods for improving physical performance either through assistive devices and/or therapy, medical management, and design, evaluation and manufacture of assistive devices, e.g., prostheses.

This course has been designed to provide you with a theoretical and practical understanding of the application of biomechanics in physical rehabilitation and assistive technology. You will be partnered with a person with disability or a clinician who works with people with disability to design and develop a particular technology need (as defined by the end user). There will be a variety of activities to support you in this course; these include a combination of lectures, tutorials, laboratories, and clinical fieldwork. These activities will be conducted remotely in 2020.

**Student learning outcomes**

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

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

| Learning Outcome | | EA Stage 1 Competencies |
|---|---|---|
| 1. | To **explain** the concepts of impairment, disability and how biomechanics is used in physical rehabilitation. | PE1.1, PE3.2, |
| 2. | To **recognise** biomechanical principles that relate to assistive devices and conditions which require these devices. | PE1.1, PE1.2 |
| 3. | To **recognise** current Rehabilitation Engineering practice. | PE1.1, PE1.6 |
| 4. | To **apply** the principles of biomechanics to a range of rehabilitation strategies and problem solving. | PE1.2, PE1.3, PE2.1, PE2.3, PE2.4, PE3.1, PE3.2, PE3.3, PE3.4, PE3.5, PE3.6 |

# 4. Teaching strategies

This course is delivered using a variety of teaching strategies.

| | |
|---|---|
| **Private Study** | • Review lecture material and textbook<br>• Complete assignments<br>• Join Moodle and Teams discussions<br>• Reflect on class content<br>• Download materials from Moodle<br>• Keep up with notices and find out marks via Moodle |
| **Online Lectures (Moodle)** | • Find out what you must learn<br>• Learn theoretical concepts of rehabilitation engineering and assistive technology |
| **Tutorials (Teams)** | • Guided study<br>• Assistance with assignments<br>• Discussions with colleagues<br>• Question and answer sessions |
| **Laboratories (Learning@Making)** | • Develop skills necessary to complete assignments |
| **Clinical Fieldwork (Teams, Zoom, Skype, etc.)** | • Interviews, conversations, discussions with partners<br>• Apply principles of co-design to develop solutions |
| **Assessments** | • Demonstrate your knowledge and skills<br>• Demonstrate higher understanding and problem solving |

Lectures will be delivered online via Moodle and include concept development, problem solving and discussion sessions. These will cover the theory supporting experimental methods and the practical research problems. Laboratories and tutorials are designed to explain the concepts introduced in the online lectures 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. Teams will be used for informal communication between the course staff and your colleagues. It will also be used to deliver tutorials. Assessments and feedback 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 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 clinical fieldwork is expected and will allow for alternative methods of absorbing the relevant information.

**Expectations of students.** Attendance at the tutorials, laboratories and clinical fieldwork is compulsory. Non-attendance for reasons other than misadventure will preclude you from submitting the assignment related to the activity you missed. Course staff will record attendance. Note that you may need to meet your partner outside of the designated class times.

# 5. Course schedule

| **Week** | **Topic** (Moodle; own time) | **Lab*** (online; own time) | **Tutorial** (Teams; timetabled) | **Assessment** (check assignment for due date) |
|---|---|---|---|---|
| 1 | Disability Awareness Training | - | Welcome | |
| 2 | International Classification of Functioning | | Partner Meeting 1 | |
| 3 | Rehabilitation Engineering and Assistive Technology | | Design Requirements | Setup (10%) |
| 4 | Models of Assistive Technology | | Preliminary Design | Sketch (10%) |
| 5 | Principles of Codesign | | Codesign Workshop | |
| 6 | *Flexibility Week* | | | |
| 7 | | | Partner Meeting 2 | Pitch 1 (10%) |
| 8 | | | Design Refinement | |
| 9 | | | Design Manufacture | |
| 10 | | | Partner Meeting 3 | Pitch 2 (10%) |
| 11 | | | | Portfolio (60%) |

***** These will be individualised for you and your academic background. We will work together in the first tutorial to determine which learning modules are appropriate to you and required to complete your project successfully.

# 6. Assessment

## Assessment overview

| Assessment | Group Project? (# Students per group) | Length | Weight | Learning outcomes assessed | Assessment criteria | Due date and submission requirements | Deadline for absolute fail | Marks returned |
|---|---|---|---|---|---|---|---|---|
| Setup | No | 2 – 3 pages | 10% | 1 | Design requirements | Prior to class in Week 3 | 5 days after due date | Two weeks after submission |
| Sketch | No | 1 page | 10% | 2 – 4 | Communication of preliminary design concept | Prior to class in Week 4 | 5 days after due date | Two weeks after submission |
| Pitches (2) | No | 2 – 5 mins | 20% | 1 – 4 | Oral communication of design concepts | 9am on the Monday of the week specified | 5 days after due date | Two weeks after submission |
| Portfolio | No | N/A | 60% | 1 – 4 | Design, design evolution, reflection | 5pm Monday of Week 11 | 5 days after due date | Two weeks after submission |

## Assignments

Setup (10%). This is a short assignment that will ask to you to apply the International Classification to your individual project. You will also synthesise what you learned during your first partner meeting to list the design requirements for your particular project.

Sketch (10%). You will use what you have learned in the online laboratories and/or your previous academic experiences to sketch a concept design that meets the design requirements of your partner.

Pitches (20%). Communication is very important, especially when people come from very different backgrounds. You will complete two pitches as part of this course. The first pitch is a short pitch of two minutes that will prepare you for your second partner meeting. The second pitch will prepare you for your third partner meeting. It will be limited to five minutes in duration.

Portfolio (60%). The portfolio is the showcase of your design and its evolution. It will include a design diary that will enable the reader to follow the evolution of your design. Also in the portfolio will be a one-page infographic that summarises your design, a comprehensive manufacturing plan for your design and a short reflection of your experiences in the course.

*Presentation*

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

*Submission*

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item.

*Marking*

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

**Special consideration and supplementary assessment**

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

**Please note** that UNSW now has a Fit to Sit / Submit rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

## 7. Expected resources for students

No specific textbooks are required for this course. Useful references will be listed on Moodle when required (https://moodle.telt.unsw.edu.au/login/index.php). Students seeking additional resources can also obtain assistance from the UNSW Library at http://library.unsw.edu.au/.

## 8. Course evaluation and development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, recent improvements resulting from student feedback include the development of independent learning modules to accommodate students from all different backgrounds to ensure that all students can succeed and contribute meaningfully to the course.

## 9. Academic honesty and plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here:
www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

# 10. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

# Appendix A: Engineers Australia (EA) Competencies

*Stage 1 Competencies for Professional Engineers*

| | **Program Intended Learning Outcomes** |
|---|---|
| **PE1: Knowledge and Skill Base** | PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals |
| | PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing |
| | PE1.3 In-depth understanding of specialist bodies of knowledge |
| | PE1.4 Discernment of knowledge development and research directions |
| | PE1.5 Knowledge of engineering design practice |
| | PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice |
| **PE2: Engineering Application Ability** | PE2.1 Application of established engineering methods to complex 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 |
| **PE3: Professional and Personal Attributes** | PE3.1 Ethical conduct and professional accountability |
| | PE3.2 Effective oral and written communication (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 |