

MENG4100: Implants and Assistive Technologies

Callaghan

Semester 1 - 2024



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description The course will provide the necessary design and analytical skills for developing implants, rehabilitation, and assistive technology equipment. The design and mechanics of hip, knee, and other joint replacements, fracture repair devices and spinal implants will be discussed.

This involves the application of biomechanics principles to the design of rehabilitation equipment as well as the design of internal and external prostheses and orthoses. The course will survey the design and application of rehabilitation engineering and assistive technologies in a wide range of areas, including wheeled mobility.

Academic Progress Requirements Nil

Contact Hours **Callaghan**
Integrated Learning Session
Face to Face On Campus
4 hour(s) per week(s) for 12 week(s)

Unit Weighting 10

Workload Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

CONTACTS

Course Coordinator	Callaghan Dr Changyan He Changyan.He@newcastle.edu.au (02) 4055 0264 Consultation: EAG24
Teaching Staff	Other teaching staff will be advised on the course Canvas site.
School Office	School of Engineering EAG02 EA Building Callaghan +61 2 4921 5798 9.00am-1.00pm and 2.00pm-5.00pm (Monday to Friday)

SYLLABUS

Course Content	<ul style="list-style-type: none">• Joint diseases and treatments, including research advances in biomechanics, arthroplasty and biomaterials and bone graft substitutes.• Fractures and fracture management, including the design of implants and assistive technology for the treatment, management, and outcomes of spinal injuries.• Design considerations for specific patient groups such as paediatrics, military injuries, and/or advanced age.• Assistive technology for rehabilitation, and post injury including devices used in physiotherapy, post-surgery, and equipment for non-hospital settings.• Sociocultural considerations in healthcare, including impacts of class, gender, culture, ethnicity, age, and work on health and access to healthcare.
Course Learning Outcomes	<p>On successful completion of this course, students will be able to:</p> <ol style="list-style-type: none">1. Identify the scope and role of medical implants and assistive devices in our health care system.2. Describe the principal, functional components of modern medical technologies used in monitoring of physiological function, diagnosis, and treatment.3. Work in interdisciplinary teams to review, critique and improve medical device design, in order to create positive outcomes for clients.4. Research, analyse, synthesise, condense, and disseminate complex scientific and technical information.5. Identify ethical, social, cultural, and economic considerations related to an introduction and use of medical implants and assistive technology, and articulate considerations to support equity-focused healthcare.
Course Materials	<p>Recommended Text:</p> <ul style="list-style-type: none">- Software: Creo(Provided free of charge by the University of Newcastle) <p>Reading materials: Joseph B. Webster, Douglas P. Murphy - Atlas of Orthoses and Assistive Devices- ELSEVIER (2017)</p>

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Case Study/Problem Based Learning 1	Week 6 (Monday)	Individual	35%	1, 2, 4, 5
2	Case Study/Problem Based Learning 2	Week 13 (Monday)	Individual	35%	2, 3, 4, 5
3	Report	Week 13 Lab and Lecture	Individual	30%	2, 3, 4, 5

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Case Study/Problem Based Learning 1

Assessment Type Case Study / Problem Based Learning
Description The report involves designing and prototyping (using 3D printing) a prosthetic leg for a person with a transfemoral amputation. The user's needs will be given.
Weighting 35%
Due Date Week 6 (Monday)
Submission Method Online
Assessment Criteria Provided on the Assessment Brief
Return Method Online
Feedback Provided
Opportunity to Reattempt Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 2 - Case Study/Problem Based Learning 2

Assessment Type Case Study / Problem Based Learning
Description This project is to design and implement a simple myoelectric prosthetic hand using MyoWare muscle sensors and servo motors.
Weighting 35%
Due Date Week 13 (Monday)
Submission Method Online
Assessment Criteria Provided on the Assessment Brief.
Return Method Online
Feedback Provided
Opportunity to Reattempt Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 3 - Report

Assessment Type Report
Description This report allows you to select and present on a topic relevant to implant and assistive technology.
Weighting 30%
Due Date Week 13 Lab and Lecture
Submission Method In Class
Assessment Criteria Provided on the Assessment Brief
Return Method In Class
Feedback Provided
Opportunity to Reattempt Students WILL NOT be given the opportunity to reattempt this assessment.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

**Adverse
Circumstances**

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:

<https://policies.newcastle.edu.au/document/view-current.php?id=236>

**Important Policy
Information**

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at <https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

This course outline was approved by the Head of School on 01.02.2024. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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Graduate Profile Statements – MENG4100 – S1 2024

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers):

UON Att.	University of Newcastle Bachelor of Engineering Graduate Profile Statements/ Engineers Australia Stage 1 competency statements	Taught	Practised	Assessed	Skill Level (1-4)
	Professional Attributes				
11	3.1. Ethical conduct and professional accountability			✓	4
12	3.2. Effective oral and written communication in professional and lay domains.			✓	3
13	3.3. Creative, innovative and pro-active demeanour.			✓	4
14	3.4. Professional use and management of information.				
15	3.5. Orderly management of self, and professional conduct.			✓	4
16	3.6. Effective team membership and team leadership.				
	Engineering Ability				
7	2.1. Application of established engineering methods to complex engineering problem solving.	✓	✓	✓	4
8	2.2. Fluent application of engineering techniques, tools and resources.	✓	✓	✓	4
9	2.3. Application of systematic engineering synthesis and design processes.	✓	✓	✓	4
10	2.4. Application of systematic approaches to the conduct and management of engineering projects.				
	Knowledge Base				
1	1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	✓	✓	✓	3
2	1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.				
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.			✓	4
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.	✓	✓	✓	3
5	1.5. Knowledge of contextual factors impacting the engineering discipline.				
6	1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.				