



MECH4001

Product Design Engineering

Session 1, In person-scheduled-weekday, North Ryde 2023

School of Engineering

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General Information

Unit convenor and teaching staff

Convenor, Lecturer

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Monday, 10am to 12pm

Co-convenor

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Credit points

10

Prerequisites

((MECH3003 or MECH303) and (MECH3001 or MECH301) and (MECH3004 or MECH304) and (MECH3002 or MECH302)) or Admission to MEngMechEng

Corequisites

Co-badged status

Unit description

This is a capstone unit. This unit examines the entire product design cycle from conceptualization of ideas to design, manufacturing and marketing. Students are expected to effectively apply knowledge in the field of mechanical engineering to produce innovative products with sound value proposition. Students are expected to apply state-of-the-art design and manufacturing techniques, advanced composites (including biomaterials) or other creative and innovative approaches in their product innovations.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Apply acquired analytical and theoretical techniques to the design and development of an innovative product.

ULO2: Create an innovative product based on evidence of market opportunities leading to a commercially viable product.

ULO3: Assess and evaluate the critical aspects of product design and development in a mechanical engineering context.

ULO4: Demonstrate team-building abilities and communication skills in the design and development of a product.

ULO5: Demonstrate professionalism in engaging with industry experts and companies through practical learning activity.

General Assessment Information

Grading and passing requirements for this unit

To pass this unit, a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD).

Please refer below to the policies and procedures section for further details about grading.

Refer to iLearn for information regarding the attendance of SGTA starting from week 1.

Late submission policies and guidelines

Late assessments are not accepted in this unit unless a Special Consideration has been submitted and approved.

Special consideration for the final exam

There is no final exam for this unit. The final major assessment is the final report. Please refer to the above section on late submission policies and guidelines.

Assessment tasks

1. Professional engagement and logbook: SGTA is a weekly event starting from week 1, and participation in SGTAs is compulsory. Students are expected to work in groups every week to deliver specific outcomes described clearly in a document, "Guidelines and Rubrics for MECH4001", in ILEARN. Students will be given a logbook, and information discussed, ideas and concepts derived during the week must be journaled in the logbook. A lecture will be given before the SGTA from week 1 to week 6. Ongoing verbal and some written feedback will be given in the logbook during the semester. Students are expected to have a weekly discussion with the teaching staff during the SGTA.
2. In-class online quiz: Mid-term quiz is in week 8, and it will be online. Students will be given more information near the date. The quiz covers all content in the lecture.
3. Final design report: See details of the expectations required, including the marking guidelines and rubrics in the document - "Guidelines and Rubrics for MECH4001" in ILEARN.

4. Pitch presentation: See details of the expectations required, including the marking guidelines and rubrics in the document - "Guidelines and Rubrics for MECH4001" in ILEARN.

Students are expected to receive the grades for their assessment submission between 2 to 4 weeks.

Assessment Tasks

Name	Weighting	Hurdle	Due
A5. Professional Engagement and Log Book	30%	No	Week 13
A2. In-class online quiz	10%	No	Week 8
A4. Final design report	35%	No	Week 13
A3. Final Shark Tank Presentation	25%	No	Week 13

A5. Professional Engagement and Log Book

Assessment Type ¹: Log book

Indicative Time on Task ²: 64 hours

Due: **Week 13**

Weighting: **30%**

A professional and satisfactory participation and engagement to a majority of learning activities. A physical log book that professionally documents the consistent work output throughout the semester. This will need to reflect the final presented work in terms of design, idea evolution and calculations. 2 hours are allocated to the reading of a document that entails information regarding the expectations, rubrics and guidelines of the logbook.

On successful completion you will be able to:

- Demonstrate professionalism in engaging with industry experts and companies through practical learning activity.

A2. In-class online quiz

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 1 hours

Due: **Week 8**

Weighting: **10%**

In class online quiz on lecture materials delivered in the unit.

On successful completion you will be able to:

- Assess and evaluate the critical aspects of product design and development in a mechanical engineering context.

A4. Final design report

Assessment Type ¹: Report

Indicative Time on Task ²: 17 hours

Due: **Week 13**

Weighting: **35%**

A final report that showcases the work that has been conducted in the project work over the semester. This is an individualised submission that demonstrates the technical competency of the individual.

On successful completion you will be able to:

- Apply acquired analytical and theoretical techniques to the design and development of an innovative product.
- Create an innovative product based on evidence of market opportunities leading to a commercially viable product.
- Demonstrate team-building abilities and communication skills in the design and development of a product.
- Demonstrate professionalism in engaging with industry experts and companies through practical learning activity.

A3. Final Shark Tank Presentation

Assessment Type ¹: Presentation

Indicative Time on Task ²: 15 hours

Due: **Week 13**

Weighting: **25%**

The final presentation will be held in week 13, which emulates a shark tank pitch. Students are required to present their product/design innovations to industry experts and internal assessors. Student groups are expected to be able to articulate the value proposition of their work. Students are also expected to attend the entire 3-hour presentation session in week 13.

On successful completion you will be able to:

- Apply acquired analytical and theoretical techniques to the design and development of an innovative product.
- Create an innovative product based on evidence of market opportunities leading to a commercially viable product.
- Demonstrate team-building abilities and communication skills in the design and development of a product.
- Demonstrate professionalism in engaging with industry experts and companies through practical learning activity.

¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Textbook

The unit covers the majority of the content in

1. "Product Design and Development" by Ulrich and Eppinger
2. "Product Design for Engineers" by Devdas Shetty

It is not mandatory to purchase the textbooks, but students are encouraged to own the textbooks

Running of practicals and tutorials in Week 1

SGTA commences in Week 1.

On-campus activities

Students must contact the convenor as soon as possible if they are unable to attend the On-campus activities. The On-campus activities are the weekly SGTAs, and the Pitch presentation.

Technology used

Students are expected to use a scientific calculator, and other tools such as Microsoft Excel spreadsheet, ANSYS to determine and optimise the engineering solutions for the products which they are designing.

Methods of Communication

We will communicate with students via your university email or through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to any of the teaching staff from your university email address.

COVID Information

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: <https://www.mq.edu.au/about/coronavirus-faqs>. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

Unit Schedule

Refer to iLearn and lecture notes for the unit schedule.

EA Competency Standard		Unit Learning Outcomes
Knowledge and Skill Base	1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline.	1
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	1,2
	1.3 In-depth understanding of specialist bodies of knowledge	1,2
	1.4 Discernment of knowledge development and research directions	1,2
	1.5 Knowledge of engineering design practice	1,2
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	2,3
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	2,3,
	2.2 Fluent application of engineering techniques, tools and resources.	3,4,5
	2.3 Application of systematic engineering synthesis and design processes.	3,4,5
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	3,4,5

Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	4,5
	3.2 Effective oral and written communication in professional and lay domains.	4,5
	3.3 Creative, innovative and pro-active demeanour.	4,5
	3.4 Professional use and management of information.	4,5
	3.5 Orderly management of self, and professional conduct.	4,5
	3.6 Effective team membership and team leadership	4,5

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Changes from Previous Offering

Changes from the 2022 offering.

- Rotation of main convenor
- Emphasis on the need for a physical log book.
- Update of "MECH4001 assessments – expectations, rationale and guidelines"
- Update on products and project scope.

Engineers Australia Competency Mapping

All key learning outcomes of this unit (see learning outcomes section; ULO1 – ULO5) are designed to meet the requirements of the Engineers Australia competency standard. The table below shows how the learning outcomes are mapped to the requirements.

Engineers Australia Competency Mapping

EA Competency Standard		Unit Learning Outcomes
Knowledge and Skill Base	1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline.	1
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	1,2
	1.3 In-depth understanding of specialist bodies of knowledge	1,2
	1.4 Discernment of knowledge development and research directions	1,2
	1.5 Knowledge of engineering design practice	1,2
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	2,3
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	2.3 Application of systematic engineering synthesis and design processes.	3,4,5

	2.4 Application of systematic approaches to the conduct and management of engineering projects.	3,4,5
Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	4,5
	3.2 Effective oral and written communication in professional and lay domains.	4,5
	3.3 Creative, innovative and pro-active demeanour.	4,5
	3.4 Professional use and management of information.	4,5
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	3.6 Effective team membership and team leadership	4,5