MECH401

Product Design Engineering

S1 Day 2019

School of Engineering

Contents

General Information

Unit convenor and teaching staff
Convenor
Shaokoon Cheng
shaokoon.cheng@mq.edu.au
Contact via +61 2 9850 2234
WR44 Room 119
Monday 12-2pm or via Email appointments

Co-convenor
Nicholas Tse
nicholas.tse@mq.edu.au
Contact via +61 2 9850 9075
WR50 Level 1
Friday 2-4pm or via Email appointment

Credit points
3

Prerequisites
9cp at 300 level including MECH303

Corequisites

Co-badged status

Unit description
Students learn about the entire product design cycle from conceptualization of ideas to design, manufacturing and marketing. Students will be exposed to a range of consumer products and will implement their prior knowledge on how to improve existing designs by applying to state-of-the-art design and manufacturing techniques, advanced composites (including biomaterials) and different approaches that can be used to reduce the cost of final products. These products range from electronic household products, to biomedical implants and specific parts/ components of large machines used in heavy industries.

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:

Demonstrate an ability to apply the analytical, design, and theoretical techniques learned throughout the first 3 years of the degree to the design and development of a new innovative product.
Demonstrate team building abilities and communication skills in the multidisciplinary design of a new product.
Define and critically assess the key features of product design and development in a mechanical engineering context.
Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

General Assessment Information

Grading and passing requirement for unit

In order 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).

For further details about grading, please refer below in the policies and procedures section.

Late submissions and Resubmissions

For assignments handed in late the following penalties apply: 0-24hrs -25%, 24-48hrs -50%, more than 48hrs -100%. Extenuating circumstances will be considered upon lodgment of a formal notice of disruption of studies.

Resubmissions of work are not allowed.

Additional information

1. The only invigilated assessment is an in-class test to take place in the week 10 lecture.

2. There are no hurdle assessments.

3. Rubrics for all assessments are standards based and will be made available on iLearn by week 1.

4. For each group assessment handed in, it is an absolute requirement that the group submits the signed MECH401 assignment coversheet (to be made available on iLearn) clearly indicating specific individual contributions of each team member so that individual marks are provided accordingly. In the event that an assignment is submitted without a fully completed MECH401 coversheet then the assignment will be deemed a late submission and the penalties from point (4) above will apply until the coversheet is submitted.

Assessment Tasks

Name	Weighting	Hurdle	Due
Tutorial	10%	No	Weeks 2 - 8
In Class Test	10%	No	Week 10
Assignments	30%	No	Weeks 2 - 10
Final Presentation	20%	No	Week 13
Final design report	30%	No	Week 13

Tutorial

Due: **Weeks 2 - 8**
Weighting: **10%**

In class tutorial problems.

Marks will be **REMOVED** based on a lack of engagement and participation in workshop activities.

On successful completion you will be able to:

- Demonstrate an ability to apply the analytical, design, and theoretical techniques learned throughout the first 3 years of the degree to the design and development of a new innovative product.
- Define and critically assess the key features of product design and development in a mechanical engineering context.
- Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

In Class Test

Due: **Week 10**
Weighting: **10%**

Invigilated class test

This will be held during the lecture hours scheduled. There will be more information on iLearn at a later time closer to the examination day.

On successful completion you will be able to:

- Demonstrate an ability to apply the analytical, design, and theoretical techniques learned

throughout the first 3 years of the degree to the design and development of a new innovative product.

Assignments

Due: **Weeks 2 - 10**
Weighting: **30%**

Individual and group assignments

These will be work submission that is required as a part of your workshop activities. All the classes have been scheduled for you to data-collect and develop these work submissions either during class or in between classes.

Marking rubrics and activity details are provided on iLearn.

On successful completion you will be able to:

- Demonstrate an ability to apply the analytical, design, and theoretical techniques learned throughout the first 3 years of the degree to the design and development of a new innovative product.
- Demonstrate team building abilities and communication skills in the multidisciplinary design of a new product.
- Define and critically assess the key features of product design and development in a mechanical engineering context.
- Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

Final Presentation

Due: **Week 13**
Weighting: **20%**

Presentation

Final oral "Shark Tank" style pitch and presentation. Industry personnel will be invited to grade presentation quality. The venue of the presentation is intended to be at the MQ Incubator venue, however, this will be confirmed at a later time closer to the date on iLearn.

On successful completion you will be able to:

- Demonstrate team building abilities and communication skills in the multidisciplinary design of a new product.
- Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

Final design report

Due: **Week 13**
Weighting: **30%**

Design report submission

Final Design report; students must submit a table of contribution from each student member in the group. This will be taken in the account to generate the individualized group project mark.

More details on iLearn.

On successful completion you will be able to:

- Demonstrate an ability to apply the analytical, design, and theoretical techniques learned throughout the first 3 years of the degree to the design and development of a new innovative product.
- Demonstrate team building abilities and communication skills in the multidisciplinary design of a new product.
- Define and critically assess the key features of product design and development in a mechanical engineering context.
- Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

Delivery and Resources

The following texts are recommended for this unit:

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

Technology include:

1. Web learning tool; website link on iLearn.
2. In class computers and CREO CAD software will be provided.

Unit Schedule

Refer to iLearn and lecture notes for the unit schedule. The topics to cover will loosely follow the following order:

1. Brainstorming of product/problem ideas
2. assessing idea innovation and creativity
3. derivation of concept variant and design for manufacturing and assembly

4. market analysis, benchmarking and cost analysis
5. FMEA analysis
6. Design and technical analysis
7. Prototyping and detailed FMEA analysis
8. Final "Shark-tank" pitch and presentation

Learning and Teaching Activities

Lectures

Weekly bihourly lectures

Weekly 3 hourly tutorial

No tutorial will be running in week 1, students must participate in all tutorial workshop and will be graded on their participation and engagement.

Invigilated class test

In class test, will be confirmed on iLearn.

Semseter long team assignment

A majority of the grades from this unit will be from this assessment task. Students will form small groups to conceptualize and develop a product. Associated submittable tasks will be required from each student and will include a final presentation on the work as a group. More information will be available on iLearn.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (htt

ps://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/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

Student Support

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

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Demonstrate an ability to apply the analytical, design, and theoretical techniques learned throughout the first 3 years of the degree to the design and development of a new innovative product.
- Define and critically assess the key features of product design and development in a mechanical engineering context.
- Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

Assessment task

- Assignments

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcome

- Demonstrate team building abilities and communication skills in the multidisciplinary design of a new product.

Assessment tasks

- Final Presentation
- Final design report

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they

participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Demonstrate an ability to apply the analytical, design, and theoretical techniques learned throughout the first 3 years of the degree to the design and development of a new innovative product.
- Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

Assessment task

- Final design report

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Demonstrate an ability to apply the analytical, design, and theoretical techniques learned throughout the first 3 years of the degree to the design and development of a new innovative product.
- Define and critically assess the key features of product design and development in a mechanical engineering context.

Assessment tasks

- Tutorial
- In Class Test
- Assignments

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to

critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Demonstrate an ability to apply the analytical, design, and theoretical techniques learned throughout the first 3 years of the degree to the design and development of a new innovative product.
- Define and critically assess the key features of product design and development in a mechanical engineering context.
- Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

Assessment tasks

- Tutorial
- In Class Test
- Assignments

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Demonstrate an ability to apply the analytical, design, and theoretical techniques learned throughout the first 3 years of the degree to the design and development of a new innovative product.
- Define and critically assess the key features of product design and development in a mechanical engineering context.
- Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

Assessment tasks

- Tutorial
- Assignments

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcome

- Demonstrate team building abilities and communication skills in the multidisciplinary design of a new product.

Assessment tasks

- Tutorial
- Final Presentation
- Final design report

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

- Demonstrate an ability to innovate and develop a new product based on identifying market opportunities leading to a final engineering design and cost forecasting analysis.

Assessment task

- Final design report

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcome

- Demonstrate team building abilities and communication skills in the multidisciplinary design of a new product.

Assessment task

- Final design report

Changes from Previous Offering

Changes to the previous offering include:

2019:

- Of site visit to industry partner's showroom for introduction and enhanced topic engagement
- Invitation of external evaluators for the final pitch competition
- Venue changed for final pitch competition: to be hosted at the MQ Incubator
- Restructuring workshop activities to stress on the brainstorming activities prior to further design improvement
- Extension of the www.MQIDEA.com web tool for student work benchmarking (against previous year's cohort)

2018:

- limiting the number of mentors involved in the consultation of new product development compared to the previous offering.
- redesign the tutorial activities and involvement of technical analysis of the product during the development of the innovative product.
- the use of web platform as a benchmarking tool for good and bad design concepts.