MECH303

Mechanical Design 2

S1 Day 2016

Dept of Engineering

Contents

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General Information

Unit convenor and teaching staff
Sammy Diasinos
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Credit points
3

Prerequisites
MECH201 and MECH203 and MECH204

Corequisites

Co-badged status

Unit description
In this unit, students will develop their ability to design a mechanical system and the considerations required for manufacturing of that system. Computer Aided Design will be utilised by students to develop a mechanical system to achieve a defined task. Through a series of presentations and detailed report, students will demonstrate the design considerations made during the process of designing the proposed mechanical system. The unit will culminate with an opportunity for the students to present a constructed system and demonstrate its ability to achieve the defined task.

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:

The student will be able to apply mechanical engineering theory to solve a specific problem.

The student will be able to generate assemblies of models using CAD that will allow the redesign and modification of a system to be more efficient.

The student will be capable of utilising processes that will allow the manufacturing of a component through the use of a Computer Numerically Controlled (CNC) machines as well as an appreciation of the theory associated with them.

The student will become familiar with a number of mass manufacturing production

techniques for plastics and be able to apply them to a design with the intention of minimising cost.

The student will become familiar with a series of techniques and design considerations for manufacturing metal components in large quantities in a cost effective method.

The student will demonstrate an ability to conceptualise and realise a mechanical system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

General Assessment Information

In order to pass this unit, it is necessary for students to demonstrate satisfactory achievement of all learning outcomes, perform satisfactorily in the invigilated assessments (class tests and final examination) and perform satisfactorily overall.

Students who fail to follow the instructions provided for assessment tasks risk not having the effected sections of the assessment marked.

In the event that an assessment task is submitted late, the following penalties will apply; 0 to 24 hours -25%, 24 hours to 48 hours -50%, greater than 48 hours will result in no mark being awarded.

Assessment Tasks

Name	Weighting	Due
Assumed Knowledge Test	5%	Week 2
CAD Test	10%	Week 5
Mid-Session Test	10%	Week 8
Design Report	10%	Week 10
Project Trial and Presentation	10%	Week 10
Final Design Competition	10%	Week 12
Manufacturing Report	10%	Week 13
Final examination	35%	Examination period

Assumed Knowledge Test

Due: **Week 2**
Weighting: **5%**

A test assessing the assumed knowledge that students are expected to have obtained by

completing the pre-requisites for this course.

On successful completion you will be able to:

- The student will be able to apply mechanical engineering theory to solve a specific problem.

CAD Test

Due: **Week 5**
Weighting: **10%**

Assessment that will allow students to demonstrate their ability to create an assembly CAD model and generate a CNC path.

On successful completion you will be able to:

- The student will be able to generate assemblies of models using CAD that will allow the redesign and modification of a system to be more efficient.
- The student will be capable of utilising processes that will allow the manufacturing of a component through the use of a Computer Numerically Controlled (CNC) machines as well as an appreciation of the theory associated with them.

Mid-Session Test

Due: **Week 8**
Weighting: **10%**

A test assessing the students knowledge of material delivered up to and including Week 7.

On successful completion you will be able to:

- The student will be capable of utilising processes that will allow the manufacturing of a component through the use of a Computer Numerically Controlled (CNC) machines as well as an appreciation of the theory associated with them.
- The student will become familiar with a number of mass manufacturing production techniques for plastics and be able to apply them to a design with the intention of minimising cost.

Design Report

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

Report summarising the design decisions made to achieve the required task as well as the analysis undertaken that assists with making those decisions.

On successful completion you will be able to:

- The student will be able to apply mechanical engineering theory to solve a specific problem.
- The student will be able to generate assemblies of models using CAD that will allow the redesign and modification of a system to be more efficient.
- The student will demonstrate an ability to conceptualise and realise a mechanical system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

Project Trial and Presentation

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

Presentation describing the concept that the group has selected. The group will also have an opportunity to initially test their concept prior to the final competition.

On successful completion you will be able to:

- The student will be able to generate assemblies of models using CAD that will allow the redesign and modification of a system to be more efficient.
- The student will demonstrate an ability to conceptualise and realise a mechanical system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

Final Design Competition

Due: **Week 12**
Weighting: **10%**

Demonstration of mechanical device with a mark awarded based on the ability of the device to achieve a specified task.

On successful completion you will be able to:

- The student will be able to apply mechanical engineering theory to solve a specific problem.
- The student will be able to generate assemblies of models using CAD that will allow the redesign and modification of a system to be more efficient.
- The student will demonstrate an ability to conceptualise and realise a mechanical system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

Manufacturing Report

Due: **Week 13**
Weighting: **10%**

Report indicating how the prototype will be mass manufactured using the techniques introduced during this unit.

On successful completion you will be able to:

- The student will be capable of utilising processes that will allow the manufacturing of a component through the use of a Computer Numerically Controlled (CNC) machines as well as an appreciation of the theory associated with them.
- The student will become familiar with a number of mass manufacturing production techniques for plastics and be able to apply them to a design with the intention of minimising cost.
- The student will become familiar with a series of techniques and design considerations for manufacturing metal components in large quantities in a cost effective method.
- The student will demonstrate an ability to conceptualise and realise a mechanical system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

Final examination

Due: **Examination period**
Weighting: **35%**

Final examination assessing all the content delivered throughout the course.

On successful completion you will be able to:

- The student will be able to apply mechanical engineering theory to solve a specific problem.
- The student will be capable of utilising processes that will allow the manufacturing of a component through the use of a Computer Numerically Controlled (CNC) machines as well as an appreciation of the theory associated with them.
- The student will become familiar with a number of mass manufacturing production techniques for plastics and be able to apply them to a design with the intention of minimising cost.
- The student will become familiar with a series of techniques and design considerations for manufacturing metal components in large quantities in a cost effective method.
- The student will demonstrate an ability to conceptualise and realise a mechanical

system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

Delivery and Resources

The main text required for this course is: Introduction to Manufacturing Processes by Mikell P. Groover

Unit Schedule

Week	Lecture Topic	Lecturer	Tutorial Activity	Assessments
1	Introduction and CAD Assemblies	Dr Diasinos	No Tutorial	
2	***Diagnostic Test*** and Device Requirements	Dr Diasinos	CAD Assembly tutorial	***In lecture test***
3	Manufacturing Automation	Dr Diasinos	CNC Milling tutorial	
4	Material Removal Methods	Dr Diasinos	CNC Milling tutorial	
5	Rapid Prototyping	Dr Diasinos	***CAD Test***	***In tutorial test***
6	Polymers and Composites	Dr Kourmatzis	Case Study/Design Project Discussion	
7	Sheet forming and Joining	Dr Kourmatzis	Case Study/Design Analyse Project	
8	***Mid-Session Test***	Dr Diasinos	Manufacturing theory tutorials/ Design Analyse Project	***In lecture test***
9	Metal Casting	Dr Kourmatzis	Manufacturing theory tutorials/ Design Analyse Project	
10	Metal Forming 1	Dr Kourmatzis	***Project Trial and Presentation***	***Design Report and In tutorial practical assessment***
11	Metal Forming 2	Dr Kourmatzis	Project Design or Build	
12	***Design Competition***	Dr Kourmatzis and Dr Diasinos	Presentation Feedback	***In lecture practical assessment***
13	Revision	Dr Kourmatzis	Revision	***Manufacturing Report Due***

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessm

ent/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of 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/support/student_conduct/

Results

Results shown in *iLearn*, 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.

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

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

- The student will be able to apply mechanical engineering theory to solve a specific problem.
- The student will be able to generate assemblies of models using CAD that will allow the redesign and modification of a system to be more efficient.
- The student will be capable of utilising processes that will allow the manufacturing of a component through the use of a Computer Numerically Controlled (CNC) machines as well as an appreciation of the theory associated with them.
- The student will demonstrate an ability to conceptualise and realise a mechanical system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

Assessment tasks

- Assumed Knowledge Test
- CAD Test
- Design Report
- Project Trial and Presentation
- Final Design Competition
- Manufacturing Report
- Final examination

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 outcomes

- The student will be able to apply mechanical engineering theory to solve a specific problem.
- The student will be able to generate assemblies of models using CAD that will allow the redesign and modification of a system to be more efficient.
- The student will be capable of utilising processes that will allow the manufacturing of a component through the use of a Computer Numerically Controlled (CNC) machines as well as an appreciation of the theory associated with them.
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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

- The student will be able to generate assemblies of models using CAD that will allow the redesign and modification of a system to be more efficient.
- The student will be capable of utilising processes that will allow the manufacturing of a component through the use of a Computer Numerically Controlled (CNC) machines as well as an appreciation of the theory associated with them.
- The student will demonstrate an ability to conceptualise and realise a mechanical system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

Assessment tasks

- CAD Test
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- Final Design Competition

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

- The student will be able to apply mechanical engineering theory to solve a specific problem.
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- The student will be capable of utilising processes that will allow the manufacturing of a component through the use of a Computer Numerically Controlled (CNC) machines as well as an appreciation of the theory associated with them.
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- Design Report
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- Final Design Competition
- Manufacturing Report
- Final examination

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

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- Manufacturing Report
- Final examination

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

- The student will be able to apply mechanical engineering theory to solve a specific problem.
- The student will become familiar with a number of mass manufacturing production techniques for plastics and be able to apply them to a design with the intention of minimising cost.
- The student will become familiar with a series of techniques and design considerations for manufacturing metal components in large quantities in a cost effective method.
- The student will demonstrate an ability to conceptualise and realise a mechanical system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

Assessment tasks

- CAD Test
- Mid-Session Test
- Design Report
- Project Trial and Presentation
- Final Design Competition

- Manufacturing Report

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 outcomes

- The student will be able to generate assemblies of models using CAD that will allow the redesign and modification of a system to be more efficient.
- The student will demonstrate an ability to conceptualise and realise a mechanical system, through a prototype, that will be a viable and cost effective solution to performing a specified task.

Assessment tasks

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Changes since First Published

Date	Description
26/02/2016	The diagnostic test was listed under assessments to be in week 3, while the unit schedule indicated it should be in week 2. It will be held in week 2 and this is now reflected in the assessments section of the unit guide.