MECH303
Mechanical Design 2
S1 Day 2015
Dept of Engineering

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General Information

Unit convenor and teaching staff
Sammy Diasinos
sammy.diasinos@mq.edu.au

Credit points
3

Prerequisites
MECH203

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 http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/

Learning Outcomes

1. 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.
2. 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.
3. 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.
4. 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.
5. 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**

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumed Knowledge Test</td>
<td>5%</td>
<td>Week 3</td>
</tr>
<tr>
<td>CAD Test</td>
<td>10%</td>
<td>Week 5</td>
</tr>
<tr>
<td>Mid-Session Test</td>
<td>10%</td>
<td>Week 8</td>
</tr>
<tr>
<td>Project Trial and Presentation</td>
<td>10%</td>
<td>Week 10</td>
</tr>
<tr>
<td>Final Design Competition</td>
<td>20%</td>
<td>Week 12</td>
</tr>
<tr>
<td>Design Report</td>
<td>10%</td>
<td>Week 13</td>
</tr>
<tr>
<td>Final examination</td>
<td>35%</td>
<td>Examination period</td>
</tr>
</tbody>
</table>

**Assumed Knowledge Test**

Due: **Week 3**  
Weighting: 5%

A test assessing the assumed knowledge that students are expected to have obtained by completing the pre-requisites for this course.

This Assessment Task relates to the following Learning Outcomes:

- 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.

**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.

This Assessment Task relates to the following 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.

Mid-Session Test
Due: Week 8
Weighting: 10%
A test assessing the students knowledge of material delivered up to and including Week 7.

This Assessment Task relates to the following Learning Outcomes:
• 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.

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.

This Assessment Task relates to the following 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.

Final Design Competition
Due: Week 12
Weighting: 20%
Demonstration of mechanical device with a mark awarded based on the ability of the device to achieve a specified task.
This Assessment Task relates to the following 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.

Design Report

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

Report summarising the design decisions made to achieve the required task and indicating how the design will be modified to accommodate mass manufacturing techniques.

This Assessment Task relates to the following 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 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.

This Assessment Task relates to the following Learning Outcomes:
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

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topic</th>
<th>Lecturer</th>
<th>Tutorial Activity</th>
<th>Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, Background and Competition Instructions</td>
<td>Dr Diasinos</td>
<td>No Tutorial</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CAD Assemblies</td>
<td>Dr Diasinos</td>
<td>CAD Assembly tutorial</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Assumed Knowledge Test and Manufacturing Automation</td>
<td>Dr Diasinos</td>
<td>CNC Milling tutorial</td>
<td>In lecture test</td>
</tr>
<tr>
<td>4</td>
<td>Manufacturing Automation continued and Material Removal Methods</td>
<td>Dr Diasinos</td>
<td>CNC Milling tutorial</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Rapid Prototyping</td>
<td>Dr Diasinos</td>
<td>CAD Test</td>
<td>In tutorial test</td>
</tr>
<tr>
<td>6</td>
<td>Metal Forming</td>
<td>Dr Kabir</td>
<td>Design Project Discussion</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Metal Casting</td>
<td>Dr Kabir</td>
<td>Design/Build</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Mid-Session Test</td>
<td>Dr Diasinos</td>
<td>Design/Build</td>
<td>In lecture test</td>
</tr>
<tr>
<td>Week</td>
<td>Lecture Topic</td>
<td>Lecturer</td>
<td>Tutorial Activity</td>
<td>Assessments</td>
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</tr>
<tr>
<td>9</td>
<td>Heat Treatment and Surface Operations</td>
<td>Dr Kabir</td>
<td>Design/Build</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Shaping Processes for Plastics</td>
<td>Dr Kabir</td>
<td>Project Trial and Presentation</td>
<td>In tutorial practical assessment</td>
</tr>
<tr>
<td>11</td>
<td>Composite Manufacturing</td>
<td>Dr Kabir</td>
<td>Design/Build</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Design Competition</td>
<td>Dr Kabir, Dr Diasinos and Dr Cheng</td>
<td>Presentation Feedback and Report Writing</td>
<td>In lecture practical assessment</td>
</tr>
<tr>
<td>13</td>
<td>Revision</td>
<td>Dr Kabir</td>
<td>Revision</td>
<td>Design Report Due</td>
</tr>
</tbody>
</table>

**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:


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/](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 Enquiry Service
For all student enquiries, visit Student Connect at ask.mq.edu.au

Equity 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.

IT Help
For help with University computer systems and technology, visit http://informatics.mq.edu.au/help./

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

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 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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Assessment tasks

• Assumed Knowledge Test
• CAD Test
• Mid-Session Test
• Project Trial and Presentation
• Final Design Competition
• Design 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 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
- Project Trial and Presentation
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- Design 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

- Assumed Knowledge Test
- CAD Test
- Mid-Session Test
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- Final Design Competition
- Design 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 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.

**Assessment tasks**

- Project Trial and Presentation
- Final Design Competition
- Design 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**

- 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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Assessment tasks
- Assumed Knowledge Test
- CAD Test
- Mid-Session Test
- Project Trial and Presentation
- Final Design Competition
- Design Report
- Final examination

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 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
- Project Trial and Presentation
- Final Design Competition
- Design Report
- Final examination

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 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
- Project Trial and Presentation
- Final Design Competition

**Changes since First Published**

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>17/02/2015</td>
<td>Due date of first assessment task was not correct.</td>
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