MECH303
Mechanical Design 2
S1 Day 2016
Dept of Engineering

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Disclaimer
Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.
General Information

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

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://students.mq.edu.au/important-dates

Learning Outcomes

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

2. 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.

3. 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.

4. 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.
5. 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.

6. 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

<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 2</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>Design Report</td>
<td>10%</td>
<td>Week 10</td>
</tr>
<tr>
<td>Project Trial and Presentation</td>
<td>10%</td>
<td>Week 10</td>
</tr>
<tr>
<td>Final Design Competition</td>
<td>10%</td>
<td>Week 12</td>
</tr>
<tr>
<td>Manufacturing 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 2**  
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 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.

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.

**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.

This Assessment Task relates to the following 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 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.

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:** **10%**

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 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.

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.

**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 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.
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- 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 and CAD Assemblies</td>
<td>Dr Diasinos</td>
<td>No Tutorial</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>Diagnostic Test</strong> and Device Requirements</td>
<td>Dr Diasinos</td>
<td>CAD Assembly tutorial</td>
<td><strong>In lecture test</strong></td>
</tr>
<tr>
<td>3</td>
<td>Manufacturing Automation</td>
<td>Dr Diasinos</td>
<td>CNC Milling tutorial</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>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><strong>CAD Test</strong></td>
<td><strong>In tutorial test</strong></td>
</tr>
<tr>
<td>6</td>
<td>Polymers and Composites</td>
<td>Dr Kourmatzis</td>
<td>Case Study/Design Project</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Sheet forming and Joining</td>
<td>Dr Kourmatzis</td>
<td>Case Study/Design Analyse Project</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><strong>Mid-Session Test</strong></td>
<td>Dr Diasinos</td>
<td>Manufacturing theory tutorials/ Design Analyse Project</td>
<td><strong>In lecture test</strong></td>
</tr>
<tr>
<td>9</td>
<td>Metal Casting</td>
<td>Dr Kourmatzis</td>
<td>Manufacturing theory tutorials/ Design Analyse Project</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Metal Forming 1</td>
<td>Dr Kourmatzis</td>
<td><strong>Project Trial and Presentation</strong></td>
<td><strong>Design Report and In tutorial practical assessment</strong></td>
</tr>
<tr>
<td>11</td>
<td>Metal Forming 2</td>
<td>Dr Kourmatzis</td>
<td>Project Design or Build</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td><strong>Design Competition</strong></td>
<td>Dr Kourmatzis and Dr Diasinos</td>
<td>Presentation Feedback</td>
<td><strong>In lecture practical assessment</strong></td>
</tr>
<tr>
<td>13</td>
<td>Revision</td>
<td>Dr Kourmatzis</td>
<td>Revision</td>
<td><strong>Manufacturing Report Due</strong></td>
</tr>
</tbody>
</table>

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](http://mq.edu.au/policy/docs/). 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](http://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/](http://students.mq.edu.au/support/)

**Learning Skills**

Learning Skills ([mq.edu.au/learningskills](http://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](http://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.
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 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.

Assessment tasks

- Assumed Knowledge Test
- CAD Test
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

- Assumed Knowledge Test
- CAD Test
- Mid-Session 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.
- 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**

- Design Report
- Project Trial and Presentation
- 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**

- 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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Assessment tasks

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

• Project Trial and Presentation

• Final Design Competition

Changes since First Published

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>26/02/2016</td>
<td>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.</td>
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</tbody>
</table>