



ELEC466

Advanced Mechatronic Engineering

S1 Day 2015

Dept of Engineering

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General Information

Unit convenor and teaching staff

Unit Convenor

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E6B-122

see iLearn

Credit points

3

Prerequisites

ELEC326(P) and ELEC342(P)

Corequisites

Co-badged status

Unit description

This unit integrates prior learning in a specialist area of engineering with problem solving, emerging technology and aspects of engineering application, technical reporting and self-management to prepare students to work at a professional capacity. The unit aims to address the application of fundamental principles and methods at an advanced level in the context of standards and practices, modelling, analysis, design and practical implementation. The unit also develops skills in the critical evaluation of information, software and sources of error, and experimental methods. Learning will be achieved using case studies, laboratories, presentations, group work and/or traditional lecture format. The specific topics will focus on current advances in the area such as microcontrollers, MEMs, nanotechnologies, control systems, sensors and actuators and electro-mechanical interfacing.

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 your understanding of core concepts in three areas of engineering:
 - software, electronic and mechanical
- synthesize this knowledge and understanding in the design and creation of a

mechatronic system

Evaluate and critique relevant data and technical writing

Demonstrate planning, creativity, problem solving, initiative and time management skills in the completion of a major project

Understand a wide range of advanced topics relevant to mechatronic engineering

Assessment Tasks

Name	Weighting	Due
<u>Project Logbook</u>	15%	Week 13
<u>Engagement in Discipline</u>	3%	week 13
<u>Project Plan</u>	5%	Week 3
<u>Assignments</u>	10%	TBD
<u>Brief Technical Report</u>	5%	Week 4
<u>Improved Technical Report</u>	7%	Week 8
<u>Peer Review of Reports</u>	5%	Week 5
<u>Project Outcome and Report</u>	30%	Week 13
<u>Final Exam</u>	20%	exam period

Project Logbook

Due: **Week 13**

Weighting: **15%**

Whenever working on your major project you should use an individual log book to document your progress. This is preferably a bound paper document. In grading your log book, I will be looking for dates and times of work done, as well as evidence of quality work. This is your chance to show the good work you have done on the group project. If you produce drawings, these should be included.

The individual project log is worth 15% of your final grade:

Evidence of work and attendance in Pracs: 5 marks

Legibility, traceability and organisation: 5 marks

Evidence of Technical content including concept sketches, detailed sketches, calculations etc: 5 marks

Due: end of week 13.

On successful completion you will be able to:

- synthesize this knowledge and understanding in the design and creation of a mechatronic system
- Demonstrate planning, creativity, problem solving, initiative and time management skills in the completion of a major project

Engagement in Discipline

Due: **week 13**

Weighting: **3%**

You will be graded on your engagement with the material and the wider engineering community. You are encouraged to make contributions in class, and to share news, discoveries, triumphs, etc through the twitter #MQMechatronics, which is fed to the iLearn page, and/or on the class discussion page, and/or on the MQ Mechatronics Facebook page. As 4th year mechatronics students I hope that you will provide some interesting content for the rest of the students in the major.

This will contribute 3% to your final grade and will be assessed after week 13.

On successful completion you will be able to:

- demonstrate your understanding of core concepts in three areas of engineering: software, electronic and mechanical
- Demonstrate planning, creativity, problem solving, initiative and time management skills in the completion of a major project

Project Plan

Due: **Week 3**

Weighting: **5%**

In Week 1 you will form groups and choose a major project. Your first assignment will be a project plan. This document must clearly show

- what each member will be responsible for
- Initial concept sketches and descriptions
- Back-up plans should initial plans fail
- Budget estimates
- Timeline of deliverables and milestones
- It must include a brief section detailing the contributions of team member to the document. This should include an overall percentage contribution from each team member that must add up to 100%. This will be used to differentiate grades within a group in accordance with the grading policy.

This group document is worth 5% of your final grade. If major changes are required, an updated project plan should be submitted.

Due: End of week 3.

On successful completion you will be able to:

- Evaluate and critique relevant data and technical writing
- Demonstrate planning, creativity, problem solving, initiative and time management skills in the completion of a major project

Assignments

Due: **TBD**

Weighting: **10%**

There will be 2 or 3 short assignments that will review topics covered in lecture. These are worth a total of 10% of your final grade.

Due: TBD

On successful completion you will be able to:

- demonstrate your understanding of core concepts in three areas of engineering: software, electronic and mechanical
- Understand a wide range of advanced topics relevant to mechatronic engineering

Brief Technical Report

Due: **Week 4**

Weighting: **5%**

You are to individually prepare a brief technical report on a topic of relevance to your major project. It should cover one topic in depth, ie it must go well beyond Wikipedia summaries. You may wish to report on, component choice, material choice or manufacturing/construction/design options. In some cases reporting on the operation of a system or element of the project may be sufficient.

The report may include figures and images and should have a length of 800 to 1500 words. It must be submitted as a .doc or .docx file. The report will be graded by two of your peers and scaled appropriately to produce a class average of ~66% with ~10% Ds and HDs. It is worth 5% of your final grade.

Due: first class in week 4.

Due: first class in week 4.

On successful completion you will be able to:

- demonstrate your understanding of core concepts in three areas of engineering:
software, electronic and mechanical
- Evaluate and critique relevant data and technical writing

Improved Technical Report

Due: **Week 8**

Weighting: **7%**

You will receive your peer reviewed technical reports in Week 5. You will then act on the feedback that you receive and improve your report, paying particular attention to clarity and structure. This document will be submitted to iLearn for grading by the Lecturer. It is worth 7% of your final grade

Due: first class in week 9.

On successful completion you will be able to:

- demonstrate your understanding of core concepts in three areas of engineering:
software, electronic and mechanical
- Evaluate and critique relevant data and technical writing

Peer Review of Reports

Due: **Week 5**

Weighting: **5%**

You will provide feedback and grading on three of your peers technical reports. You will be randomly assigned three technical reports. You will provide feedback and grading on the these reports. Your feedback must be provided using “track changes” in Microsoft word, and you must anonymise the comments.

Your feedback will be graded by the lecturer/tutor, and is worth 5% of your final grade.

These two documents should also be submitted to ilearn.

Due: first class in week 5.

On successful completion you will be able to:

- Evaluate and critique relevant data and technical writing

Project Outcome and Report

Due: **Week 13**

Weighting: **30%**

Your major project will be graded for completion and quality. You must also submit a group project report. Individual scores will be based on self reported individual weightings.

This report should

- provide the reader with enough information to re-created your device.
- It should include drawings, and component data sheets.
- You may wish to include important calculations or justifications for decisions made.
- It should also include a set of instructions for using and or controlling the device.
- It must include a brief section detailing the roles and responsibilities of each team member for the project and the report. This should include an overall percentage contribution from each team member that must add up to 100% for both the project and report. This will be used to differentiate grades within a group as per the grading policy.
- It should not include a description of your journey, mental, physical, emotional or otherwise.

You must also submit (by email to me) a brief (~100 word) confidential reflection on your role in the project. At my discretion I may use this to adjust group weightings, so if you feel that a group decision disadvantaged you, this is the place to indicate that.

The project report is worth 15% of your final grade, and the project outcome is worth 15% of your final grade. Projects will normally be graded in the last hour of the last prac.

On successful completion you will be able to:

- synthesize this knowledge and understanding in the design and creation of a mechatronic system
- Demonstrate planning, creativity, problem solving, initiative and time management skills in the completion of a major project

Final Exam

Due: **exam period**

Weighting: **20%**

The final exam will cover topics dealt with in lectures. You are permitted one A4 sheet of hand-written notes. It will be a mix of hand calculations and conceptual questions. The exam duration will be 2 hours. To pass this unit you must achieve an average grade of 50% on the weighted assessment tasks and a grade of at least 40% on the final exam.

On successful completion you will be able to:

- demonstrate your understanding of core concepts in three areas of engineering: software, electronic and mechanical
- Understand a wide range of advanced topics relevant to mechatronic engineering

Delivery and Resources

Delivery: Attendance in lectures is strongly recommended. Audio or video recordings of the

lecture will not be available.

Textbook Resources: Selected topics from:

A. Smaili and F. Mrad, "Mechatronics, Integrated Technologies for Intelligent Machines", Oxford University Press, 2008.

Merle C. Potter and David C. Wiggert, "Mechanics of Fluids",

Nanua Singh, "Systems Approach to Computer-integrated Design and Manufacturing"

John J. Craig, "Introduction to Robotics"

Serope Kalpakjian, "Manufacturing Engineering and Technology"

Additional recommended readings may be assigned and provided in iLearn.

Technology and Software: We will make use of Computer Aided Drafting, namely PTC CREO and MATLAB. You will have access to computers with this software during prac, however access to these programs outside of prac will be beneficial.

Late Submissions: Unless agreed to in advance of due dates, late submissions will be penalised at a rate of 10 marks (out of 100) for every business day.

Extensions: Extensions may be granted if a valid case for disruption to studies exists. See policies and procedures below.

Unit Schedule

A unit schedule will be available on iLearn.

Learning and Teaching Activities

Group Project

Students choose a major project to complete

Assignments

Students will complete assignments as needed to consolidate learning

Technical report

Students will prepare and improve upon a brief technical report of relevance to their group project

Peer Review

Students will provide feedback to other students' technical reports.

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

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

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

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.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.

No extensions will be granted. Late tasks will be accepted up to 72* hours after the submission deadline. There will be a deduction of 20%* of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late (for example, 25 hours late in submission – 40% penalty). This penalty does not apply for cases in which an application for special consideration is made and approved.

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://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

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 outcome

- synthesize this knowledge and understanding in the design and creation of a mechatronic system

Assessment tasks

- Project Logbook
- Project Outcome and Report

Learning and teaching activities

- Students choose a major project to complete

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 planning, creativity, problem solving, initiative and time management skills in the completion of a major project

Assessment tasks

- Project Logbook
- Engagement in Discipline
- Project Plan
- Project Outcome and Report

Learning and teaching activities

- Students choose a major project to complete
- Students will prepare and improve upon a brief technical report of relevance to their group project
- Students will provide feedback to other students' technical reports.

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 your understanding of core concepts in three areas of engineering: software, electronic and mechanical
- synthesize this knowledge and understanding in the design and creation of a mechatronic system
- Understand a wide range of advanced topics relevant to mechatronic engineering

Assessment tasks

- Project Logbook
- Engagement in Discipline
- Assignments
- Brief Technical Report
- Improved Technical Report
- Project Outcome and Report

- Final Exam

Learning and teaching activities

- Students choose a major project to complete

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 your understanding of core concepts in three areas of engineering: software, electronic and mechanical
- Understand a wide range of advanced topics relevant to mechatronic engineering

Assessment tasks

- Engagement in Discipline
- Assignments
- Brief Technical Report
- Improved Technical Report
- Final Exam

Learning and teaching activities

- Students choose a major project to complete
- Students will complete assignments as needed to consolidate learning

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 outcome

- synthesize this knowledge and understanding in the design and creation of a

mechatronic system

Assessment tasks

- Project Logbook
- Project Outcome and Report

Learning and teaching activities

- Students choose a major project to complete
- Students will provide feedback to other students' technical reports.

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 outcome

- synthesize this knowledge and understanding in the design and creation of a mechatronic system

Assessment tasks

- Project Logbook
- Project Outcome and Report

Learning and teaching activities

- Students choose a major project to complete
- Students will complete assignments as needed to consolidate learning

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

- Evaluate and critique relevant data and technical writing

Assessment tasks

- Project Plan
- Brief Technical Report
- Improved Technical Report
- Peer Review of Reports

Learning and teaching activities

- Students choose a major project to complete
- Students will prepare and improve upon a brief technical report of relevance to their group project
- Students will provide feedback to other students' technical reports.

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 and teaching activities

- Students will complete assignments as needed to consolidate learning
- Students will provide feedback to other students' technical reports.

Changes from Previous Offering

There are no significant structural changes to this unit from last year, however the content of some lectures will be different, and the final exam will reflect current topics.