



ENGG150

Electromechanics

S2 Day 2014

Dept of Engineering

Contents

<u>General Information</u>	2
<u>Learning Outcomes</u>	2
<u>Assessment Tasks</u>	3
<u>Delivery and Resources</u>	5
<u>Unit Schedule</u>	5
<u>Policies and Procedures</u>	6
<u>Graduate Capabilities</u>	8

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General Information

Unit convenor and teaching staff

Shaokoon Cheng

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Michael Heimlich

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Credit points

3

Prerequisites

Corequisites

MATH132 or MATH135

Co-badged status

Unit description

Students are introduced to fundamental concepts and techniques to enable analysis of electronic and mechanical systems. In the first section of the unit, students will learn about electrical circuit variables, basic circuit elements, and fundamental laws and theories concerning linear electrical circuits. In the second section of the unit, students will learn fundamental theories of mechanics, free body diagrams and their application to analyse mechanical forces in machines and structures.

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 solve problems in Electronics and Electrical circuits by using concepts and theories commonly used in electronics engineering.

The student will be able to design simple electrical circuits and draw simple circuits using computer aided tools.

The student will be able to use basic principles of mechanics to resolve a force into several components and to combine two or more forces.

The student will be able to analyze and determine forces in members and components of

machines and structure.

Understand the commonality between problems in electrical and mechanical engineering for linear systems and modeling

Assessment Tasks

Name	Weighting	Due
<u>Assignment</u>	20%	Week 7. Week 12
<u>Quiz</u>	20%	Week 7, Week 12
<u>Tutorial</u>	10%	Every week
<u>Final examination</u>	50%	TBA

Assignment

Due: **Week 7. Week 12**

Weighting: **20%**

There will be two assignments and each assignment is worth 10%. The first and second assignments will be on Mechanical and Electronic Engineering subjects respectively.

On successful completion you will be able to:

- The student will be able to solve problems in Electronics and Electrical circuits by using concepts and theories commonly used in electronics engineering.
- The student will be able to design simple electrical circuits and draw simple circuits using computer aided tools.
- The student will be able to use basic principles of mechanics to resolve a force into several components and to combine two or more forces.
- The student will be able to analyze and determine forces in members and components of machines and structure.

Quiz

Due: **Week 7, Week 12**

Weighting: **20%**

There will be two quizzes and each quiz is worth 10%. The quiz will be online and students will be expected to perform 10 randomly selected questions.

On successful completion you will be able to:

- The student will be able to solve problems in Electronics and Electrical circuits by using

concepts and theories commonly used in electronics engineering.

- The student will be able to design simple electrical circuits and draw simple circuits using computer aided tools.
- The student will be able to use basic principles of mechanics to resolve a force into several components and to combine two or more forces.
- The student will be able to analyze and determine forces in members and components of machines and structure.
- Understand the commonality between problems in electrical and mechanical engineering for linear systems and modeling

Tutorial

Due: **Every week**

Weighting: **10%**

Student understanding of a particular topic/ subject will be assessed based on their ability to solve tutorial/ laboratory questions. This will be assessed by the tutors.

On successful completion you will be able to:

- The student will be able to solve problems in Electronics and Electrical circuits by using concepts and theories commonly used in electronics engineering.
- The student will be able to design simple electrical circuits and draw simple circuits using computer aided tools.
- The student will be able to use basic principles of mechanics to resolve a force into several components and to combine two or more forces.
- The student will be able to analyze and determine forces in members and components of machines and structure.
- Understand the commonality between problems in electrical and mechanical engineering for linear systems and modeling

Final examination

Due: **TBA**

Weighting: **50%**

This is a closed book exam and will include questions on both Mechanical (50%) and Electronics (50%) engineering.

On successful completion you will be able to:

- The student will be able to solve problems in Electronics and Electrical circuits by using concepts and theories commonly used in electronics engineering.

- The student will be able to design simple electrical circuits and draw simple circuits using computer aided tools.
- The student will be able to use basic principles of mechanics to resolve a force into several components and to combine two or more forces.
- The student will be able to analyze and determine forces in members and components of machines and structure.
- Understand the commonality between problems in electrical and mechanical engineering for linear systems and modeling

Delivery and Resources

Text books

1. JL Meriam and LG Kraige, “Engineering Mechanics (volume 1). Statics.”
2. Dorf & Svoboda, “Introduction to Electric Circuits (9th edition).”

Unit Schedule

Week	Lecture Topic	Lecturer	Practical/ Tutorial	Due Assignments/ Tasks
Week 1	Introduction to Mechanical Engineering and mechanics (Statics).	Shaokoon Cheng		
Week 2	Force as vectors. Parallelogram law of combination.	Shaokoon Cheng	Revision on trigonometry, basic geometries and solving algebraic equations.	
Week 3	Moment of force and coupling.	Shaokoon Cheng	Force as vectors. Parallelogram law of combination.	
Week 4	Newton’s law and equilibrium.	Shaokoon Cheng	Moment of force and coupling.	
Week 5	Free body diagrams. Analyzing forces in structures and machines.	Shaokoon Cheng	Newton’s law and equilibrium.	

Week 6	Analyzing forces in trusses.	Shaokoon Cheng	Free body diagrams. Analyzing forces in structures and machines.	
Week 7	Friction and virtual work.	Shaokoon Cheng	Analyzing forces in trusses.	Quiz 1 (10%) Assignment 1: Mechanical engineering (10%)
Semester break				
Week 8	Introduction to Electrical Engineering and electronics (Statics).	Prof Michael Heimlich		
Week 9	Circuit Elements	Prof Michael Heimlich	Voltage, Current, Power, and Energy	
Week 10	Resistive Circuits	Prof Michael Heimlich	Resistors and Ohm's Law Independent and dependent sources Meters and switches	
Week 11	Circuit Analysis: Nodal Analysis	Prof Michael Heimlich	Kirchoff's Laws Voltage and Current dividers Sources in series and parallel	
Week 12	Linear Systems in Electrical and Mechanical Engineering:	Prof Michael Heimlich	Linearity Superposition	Assignment 2: Electronics engineering (10%) Quiz 2 (10%)
Week 13	Circuit Analysis: Mesh Analysis	Prof Michael Heimlich	Circuits with voltage sources Circuits with arbitrary sources	

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/

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

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 solve problems in Electronics and Electrical circuits by using concepts and theories commonly used in electronics engineering.
- The student will be able to design simple electrical circuits and draw simple circuits using computer aided tools.
- The student will be able to use basic principles of mechanics to resolve a force into several components and to combine two or more forces.
- The student will be able to analyze and determine forces in members and components of machines and structure.
- Understand the commonality between problems in electrical and mechanical engineering for linear systems and modeling

Assessment tasks

- Assignment
- Quiz
- Tutorial
- 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 solve problems in Electronics and Electrical circuits by using concepts and theories commonly used in electronics engineering.
- The student will be able to design simple electrical circuits and draw simple circuits using computer aided tools.
- The student will be able to use basic principles of mechanics to resolve a force into several components and to combine two or more forces.
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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 solve problems in Electronics and Electrical circuits by using concepts and theories commonly used in electronics engineering.
- The student will be able to design simple electrical circuits and draw simple circuits using computer aided tools.
- The student will be able to analyze and determine forces in members and components of machines and structure.
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Assessment tasks

- Assignment

- Quiz
- Tutorial
- 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 solve problems in Electronics and Electrical circuits by using concepts and theories commonly used in electronics engineering.
- The student will be able to design simple electrical circuits and draw simple circuits using computer aided tools.
- The student will be able to analyze and determine forces in members and components of machines and structure.