# ENGG150

## Electrical and Mechanical Principles

S1 Day 2018

*Dept of Engineering*

## Contents

# General Information

Unit convenor and teaching staff
Convenor, Lecturer
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Monday 4-5pm, Thursday 9-10am

Co-convenor, Lecturer
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Credit points
3

Prerequisites
(MATH132 or MATH135) and (PHYS140 or corequisite of PHYS106)

Corequisites

Co-badged status

Unit description
This unit introduces fundamental modelling approaches used to study electronic and mechanical systems, allowing engineers to predict the real-world performance of these objects. Students will apply and practice foundational physics and mathematics knowledge to construct and solve models of electronic and mechanical systems. This process enables students to study complex linear circuits and the forces and reactions that arise in real machines and structures. The study of these fundamental domains of engineering makes use of important laws, theories, concepts and abstractions that in part define the practice of electronic and mechanical engineering around the world. The concepts developed are required in later units where students design mechanical and or electronic devices or systems.

## 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:

Ability to analyse linear electrical circuits through the use of appropriate models including circuit simplifications, mesh and node analysis, and equivalent circuits.

Ability to build simple electrical circuits and measure circuit properties with a digital multi-meter.

Demonstrate the appropriate use force vectors and free body diagrams

Solve rigid-body equilibrium problems including friction

Perform structural analysis of frames and trusses

Verbally explain methods of solving fundamental engineering problems

Demonstrate foundational learning skills including active engagement in their learning process

# General Assessment Information

### Late submissions

Late submissions of assignments will be subject the penalty described above. Quizzes cannot be taken late. Missing a practical will result in a grade of 0 for that tutorial. Extenuating circumstances will be considered upon lodgement of a formal notice of disruption of studies.

### Hurdle Requirement

The final examination is a hurdle requirement because it is the only reliable assessment of individual performance for this unit. A grade of 40% or more in the final examination is a condition of passing this unit.

Participation in 10 practical sessions is a hurdle requirement (as per Faculty Policy for 100 level units). Note that practicals will be held in week 1.

### Grading and passing requirement for unit

In order to pass this unit a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD), and a grade of 40% on the final exam, and participate in at least 10 practicals.

For further details about grading, please refer below in the policies and procedures section.

### Final Examinations

Final examinations will take place at the end of the semester. For further information, please

refer to the Examination Timetable website on www.mq.edu.au

# Assessment Tasks

| Name | Weighting | Hurdle | Due |
|---|---|---|---|
| Final Exam | 50% | Yes | TBA |
| Assignments | 15% | No | Week 7 and Week 13 |
| Practicals | 20% | Yes | Everyweek |
| Online quiz | 15% | No | Week 2, week 7 and week 13 |

## Final Exam

Due: **TBA**
Weighting: **50%**
**This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)**

The final exam will test mechanical and electrical concepts, with equal weighting to each. It will be a three hour, closed book exam.

On successful completion you will be able to:

- Ability to analyse linear electrical circuits through the use of appropriate models including circuit simplifications, mesh and node analysis, and equivalent circuits.
- Demonstrate the appropriate use force vectors and free body diagrams
- Solve rigid-body equilibrium problems including friction
- Perform structural analysis of frames and trusses

## Assignments

Due: **Week 7 and Week 13**
Weighting: **15%**

There will be two assignments, each worth 7.5%. The first assignment will consist of Mechanical Engineering problems and the second assignment will consist of
Electrical Engineering problems.

Assignment 1 is due in week 7 and assignment 2 is due in week 13. A portion of the available grades will be awarded for presentation of work. Markers WILL NOT grade poorly organized or illegible scans or drafts. Well presented work is highly legible, annotated, well structured, and presented with page numbers and student IDs on every page.

Assignments are submitted electronically through iLearn. Late assignments will attract the

following penalties; 1 to 24 hours -20%, 24 hours to 48 hours -40%, greater than 48 hours will result in no mark being awarded.

On successful completion you will be able to:

- Ability to analyse linear electrical circuits through the use of appropriate models including circuit simplifications, mesh and node analysis, and equivalent circuits.
- Demonstrate the appropriate use force vectors and free body diagrams
- Solve rigid-body equilibrium problems including friction
- Perform structural analysis of frames and trusses

## Practicals

Due: **Everyweek**
Weighting: **20%**
**This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)**

13 practical sessions are run to assess and assist student learning and deepen engagement. Practical sessions will run in week #1.

Participation in at least 10 practical sessions is required to pass the unit (hurdle).

Problems for practicals will be assigned in advance. Selected problems will be graded by tutors based on written solutions (in log books only) and verbal comprehension.

Marking rubrics will be included with the task description.

Each student must have a bound notebook to be used as a laboratory/tutorial log (A4 size preferred, graph pages are not required). This logbook should also be used for any preliminary work. It should contain all results recorded during these sessions and student's comments on how a problem can be solved. It may also be used for taking notes in class, and should be used to study for exams.

On successful completion you will be able to:

- Ability to analyse linear electrical circuits through the use of appropriate models including circuit simplifications, mesh and node analysis, and equivalent circuits.
- Ability to build simple electrical circuits and measure circuit properties with a digital multi-meter.
- Demonstrate the appropriate use force vectors and free body diagrams
- Solve rigid-body equilibrium problems including friction
- Perform structural analysis of frames and trusses
- Verbally explain methods of solving fundamental engineering problems

- Demonstrate foundational learning skills including active engagement in their learning process

## Online quiz

Due: **Week 2, week 7 and week 13**
Weighting: **15%**

There will be three online quizzes. The first quiz will test background knowledge (2%) and will take place in week 2, two other quizzes will test mechanical and electrical concepts (separately), each worth 6.5%.

The quiz will be open for a specific time and all students must take the quiz during that time. All students are to ensure that they have their own resources (Computers, tablet, smart phone etc) to take part in the quiz.

On successful completion you will be able to:

- Ability to analyse linear electrical circuits through the use of appropriate models including circuit simplifications, mesh and node analysis, and equivalent circuits.
- Demonstrate the appropriate use force vectors and free body diagrams
- Solve rigid-body equilibrium problems including friction
- Perform structural analysis of frames and trusses

# Delivery and Resources

Text books:

For the mechanics part: JL Meriam and LG Kraige, "Engineering Mechanics (volume 1), Statics." Chapters 1,2,3,4 and 6.

or "Engineering Mechanics, Statics", RC Hibbeler, 14th Edition in SI units, Chapters 1,2,3,4,5,6,7,8

For the Electrics part: Allan R. Hambley, "Electrical Engineering, Principles and Applications (6th International Edition)."

or "Introduction to Electric Circuits, 9th Edition" by James A. Svoboda, Richard C. Dorf. The exact edition for either of these textbooks is not critical.

We strongly recommend that you obtain print or online access to this text, as it may be used by other units in your degree.

**Technology Used:** Lecture materials will be presented as power point slides to be downloaded through iLearn, or provided within the Echo active learning platform. In tutorials we will use batteries and power supplies, resistors, wires, and digital multimeters to construct and analyse simple circuits.

**Resources Required**: You must bring a log book to tutorial. Tutors will only mark solutions written into this log book. You should obtain a quality scientific calculator and be familiar with its

use.

# Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/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:

### Assessment task

- Assignments

## 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 foundational learning skills including active engagement in their learning process

### Assessment task

- Practicals

## 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 outcome

- Demonstrate foundational learning skills including active engagement in their learning process

### Assessment task

- Practicals

## 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

- Ability to analyse linear electrical circuits through the use of appropriate models including circuit simplifications, mesh and node analysis, and equivalent circuits.
- Ability to build simple electrical circuits and measure circuit properties with a digital multi-meter.
- Demonstrate the appropriate use force vectors and free body diagrams
- Solve rigid-body equilibrium problems including friction
- Perform structural analysis of frames and trusses

### Assessment task

- Online quiz

## 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:

### Assessment tasks

- Final Exam
- Assignments
- Practicals
- Online quiz

## 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

- Ability to build simple electrical circuits and measure circuit properties with a digital multi-meter.

### Assessment tasks

- Final Exam
- Assignments

## 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

- Verbally explain methods of solving fundamental engineering problems

## Assessment tasks

- Assignments
- Practicals

# Changes from Previous Offering

1) The Electrical section will be taught in the second half, and the mechanical section taught in the first half.

# Changes in Response to Student Feedback

No changes