



# ENGG150

## Electrical and Mechanical Principles

S2 Day 2017

*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

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Co-convenor, Lecturer

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Tuesday 9-10am

Credit points

3

Prerequisites

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

Corequisites

Co-badged status

Unit description

This unit is core for many engineering majors offered by the Department of Engineering. It 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

## General Assessment Information

### Student Responsibilities

Be familiar with University policy and College procedures and act in accordance with those policy and procedures.

It is the responsibility of the student to retain a copy of any work submitted. Students must produce these documents upon request. Copies should be retained until the end of the grade appeal period each term.

Student is to perform the required due diligent for their assessment grade and rectify as soon as possible upon finding any errors.

### Notifications

Formal notification of assessment tasks, grading rubrics and due dates will be posted on iLearn. Although all reasonable measures to ensure the information is accurate, The University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

### Report and Assignment Tasks

Assignment Problems will be posted on iLearn at least two weeks before their submission date. Assignment solutions will be posted within a week after the submission date. Submissions will not be accepted once the solution is posted.

### Assignment submissions and plagiarism policies

All assignments and reports must be submitted electronically through iLearn (in pdf format). Submissions will undergo automatic plagiarism checking. For more details on the policies of

academic penalties relating to academic honesty, please refer to the policies and procedures section below.

Submissions are expected to be typed set in a logical layout and sequence. Markers WILL NOT grade poorly organized or illegible scans or drafts. The expected workload includes preparation of final copies and clear diagrams.

### **Late submissions**

Late submissions will attract a penalty of 20/100 marks per day. 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. Students who make a serious attempt but fail to meet the hurdle requirement will be given one further opportunity to pass. A serious attempt is defined as achievement of a mark of 30% or greater.

Participation in tutorial sessions is a hurdle requirement and students are required to attend at least 3 mech and 3 elec tutorial sessions to pass this unit.

### **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).

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

### **Final Examinations**

Final examinations will typically take place at the end of the semester. For further information, please refer to the Examination Timetable website on [www.mq.edu.au](http://www.mq.edu.au)

## **Assessment Tasks**

<b>Name</b>	<b>Weighting</b>	<b>Hurdle</b>	<b>Due</b>
<a href="#"><u>Final Exam</u></a>	50%	Yes	TBA
<a href="#"><u>Assignments</u></a>	15%	No	Week 7 and Week 13
<a href="#"><u>Tutorials</u></a>	20%	No	Everyweek

Name	Weighting	Hurdle	Due
<a href="#">Online quiz</a>	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 (testing learning outcome 1) and the second assignment will consist of Electrical Engineering problems (learning outcomes 2 and 3).

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. Well presented work is highly legible, annotated, well structured, and presented with page numbers and student IDs on every page. Photographs of handwritten work will not be accepted.

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

## Tutorials

Due: **Everyweek**

Weighting: **20%**

6 mech and 6 elec focussed tutorial sessions are run to assess and assist student learning.

Participation in at least 4 mech and 4 elec tutorial or laboratory sessions is required to pass the unit.

Tutorial problems 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

## 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%), two other quizzes will test mechanical and electrical concepts (separately), each worth 7%.

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, 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](#). 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](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy [http://mq.edu.au/policy/docs/assessment/policy\\_2016.html](http://mq.edu.au/policy/docs/assessment/policy_2016.html)

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

Complaint Management Procedure for Students and Members of the Public [http://www.mq.edu.au/policy/docs/complaint\\_management/procedure.html](http://www.mq.edu.au/policy/docs/complaint_management/procedure.html)

Disruption to Studies Policy (in effect until Dec 4th, 2017): <http://www.mq.edu.au/policy/docs/dis>

[ption\\_studies/policy.html](#)

Special Consideration Policy (in effect from Dec 4th, 2017): <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration>

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/>

## 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 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](http://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/](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:

#### Assessment task

- Tutorials

### 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:

#### Assessment task

- Tutorials

### 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
- Tutorials
- 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
- Tutorials

## Changes from Previous Offering

1) The Electrical section will be taught in the first half (weeks 1-6), and the mechanical section taught in the second half (weeks 7-12).

2) The unit will not cover inductors and capacitors. An introduction to this topic is provided in PHYS140, and then covered in more detail in ELEC170.

## Changes in Response to Student Feedback

The final exam grading scheme has been simplified.

## Changes since First Published

Date	Description
06/08/2017	The weighting on the 3 online quizzes was wrong. The weight of the diagnostic quiz has been reduced
28/07/2017	re-worded some learning outcomes for clarity. split the single mechanical focused LO into 3 more detailed LOs.