

## ELEC1310: Introduction to Electrical Engineering

Singapore PSB

Trimester 1 - 2024 (Singapore)



THE UNIVERSITY OF  
NEWCASTLE  
AUSTRALIA

## OVERVIEW

**Course Description** This course introduces students to fundamental electrical elements including voltage, current, resistance, inductance, capacitance and ideal operational amplifier. It provides students with an understanding and appreciation of techniques for analysing and designing simple dc and ac circuits including balanced 3 phase circuits. It also introduces the principles behind simple electrical machines, and provides hands on experience in using a microcomputer to control a simple electrical device.

**Academic Progress Requirements** Nil

**Requisites** Students who have successfully completed FNEG1005 cannot enrol in this course.

**Assumed Knowledge** MATH1110 Mathematics 1

**Contact Hours** Singapore PSB

**Laboratory**

Face to Face On Campus  
2 hour(s) per week(s) for 13 week(s) starting Week 1

**Lecture**

Face to Face On Campus  
3 hour(s) per week(s) for 13 week(s) starting Week 1

**Tutorial**

Face to Face On Campus  
1 hour(s) per week(s) for 13 week(s) starting Week 1

**Unit Weighting** 10

**Workload** Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

# COURSE OUTLINE

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# CONTACTS

|                           |   |
|---------------------------|---|
| <b>Course Coordinator</b> | <b>Singapore PSB</b><br>Dr Colin Coates<br>Colin.Coates@newcastle.edu.au<br>+61 2 4921 8969<br>Consultation: By Email |
| <b>Teaching Staff</b>     | Other teaching staff will be advised on the course Canvas site.   |
| <b>School Office</b>      | <b>School of Engineering (Callaghan)</b><br>SENG-ADMIN@newcastle.edu.au<br>+61 2 4921 5798                            |

# SYLLABUS

|                                 |  |
|---------------------------------|--|
| <b>Course Content</b>           | <ul style="list-style-type: none"><li>• Voltage, current, reference point, Ohm's law, resistivity</li><li>• DC Circuits: Kirchoff's laws, series circuits, parallel circuits</li><li>• Capacitors and inductors: definition, characteristics, analogies, response to sinusoidal excitation</li><li>• AC circuits: Complex numbers, phasors, impedance, series circuits, parallel circuits, complex power</li><li>• Balanced 3-phase circuits: Star, Neutral, Delta</li><li>• Principles of electromechanical energy conversion: laws of electromagnetism and their application in explaining the basics of electrical machines</li><li>• Common component limitations</li><li>• Notation and units. Circuit topologies</li><li>• Operational amplifiers</li><li>• Superposition for DC and AC</li><li>• Simple design project using an Arduino Uno board</li></ul> |
| <b>Course Learning Outcomes</b> | <p><b>On successful completion of this course, students will be able to:</b></p> <ol style="list-style-type: none"><li>1. Demonstrate safe working practices in laboratories</li><li>2. Demonstrate familiarity with the problems and theoretical tools to be further developed in the electrical engineering degree</li><li>3. Analyse and design ac and dc circuits using fundamental techniques</li><li>4. Explain the operating principles of electrical machines</li><li>5. Apply knowledge and gain practical 'hands on' experience through a design exercise in the laboratory</li></ol>  |
| <b>Course Materials</b>         | <p><b>Recommended Text:</b></p> <ul style="list-style-type: none"><li>- William Hayt, Jack Kemmerly, Jamie Phillips and Steven Durbin, "Engineering Circuit Analysis" 9th Edition, McGraw Hill Education.</li></ul>  |

# COMPULSORY REQUIREMENTS

In order to pass this course, each student must complete ALL of the following compulsory requirements:

## Course Assessment Requirements:

- Assessment 1 - Lab Induction: Pass requirement - Must pass this assessment item to pass the course.
- Assessment 2 - Laboratory exercises x 3: Pass requirement 50% - Must obtain 50% in this assessment item to pass the course.

# ASSESSMENTS

This course has 5 assessments. Each assessment is described in more detail in the sections below.

|   | Assessment Name           | Due Date                              | Involvement | Weighting | Learning Outcomes |
|---|---------------------------|---------------------------------------|-------------|-----------|-------------------|
| 1 | Lab Induction*            | Week 1                                | Individual  | Formative | 1                 |
| 2 | Laboratory exercises x 3* | To be advised in Canvas.              | Group       | 15%       | 5                 |
| 3 | In class quizzes x 3      | To be advised in Canvas.              | Individual  | 15%       | 2, 3, 4           |
| 4 | Group project             | To be advised in Canvas.              | Group       | 20%       | 2, 5              |
| 5 | Final examination         | During the formal examination period. | Individual  | 50%       | 2, 3, 4           |

\* This assessment has a compulsory requirement.

## Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

## Assessment 1 - Lab Induction

|                                 |  |
|---------------------------------|--|
| <b>Assessment Type</b>          | Online Learning Activity   |
| <b>Description</b>              | This is a safety requirement to enter and work in the electrical engineering laboratories. |
| <b>Weighting</b>                | Formative  |
| <b>Compulsory Requirements</b>  | Pass requirement - Must pass this assessment item to pass the course.                      |
| <b>Due Date</b>                 | Week 1   |
| <b>Submission Method</b>        | Online   |
| <b>Assessment Criteria</b>      | To be provided in Canvas.  |
| <b>Return Method</b>            | Online   |
| <b>Feedback Provided</b>        | Online   |
| <b>Opportunity to Reattempt</b> | Students WILL be given the opportunity to reattempt this assessment.                       |

## Assessment 2 - Laboratory exercises x 3

|                                |   |
|--------------------------------|---|
| <b>Assessment Type</b>         | Tutorial / Laboratory Exercises   |
| <b>Purpose</b>                 | To give students the opportunity to design, build, test and develop a practical understanding of simple circuits. |
| <b>Description</b>             | Laboratory exercises to be completed during scheduled laboratory classes.   |
| <b>Weighting</b>               | 15%   |
| <b>Compulsory Requirements</b> | Pass requirement 50% - Must obtain 50% in this assessment item to pass the course.                                |
| <b>Due Date</b>                | To be advised in Canvas.  |
| <b>Submission Method</b>       | In Class  |
| <b>Assessment Criteria</b>     | To be provided in Canvas.   |
| <b>Return Method</b>           | In Class  |
| <b>Feedback Provided</b>       | In Class  |

**Opportunity to Reattempt** Students WILL be given the opportunity to reattempt this assessment.

### Assessment 3 - In class quizzes x 3

**Assessment Type** Quiz  
**Purpose** To test theoretical understanding of principles taught in classes.  
**Description** In class quiz with multiple choice and short answer questions.  
**Weighting** 15%  
**Due Date** To be advised in Canvas.  
**Submission Method** In Class  
**Assessment Criteria** To be provided in Canvas.  
**Return Method** In Class  
**Feedback Provided** Returned Work

### Assessment 4 - Group project

**Assessment Type** Project  
**Purpose** Practical application of the taught design and analysis principle.  
**Description** Small design project including a report (submitted online) and a presentation (in class).  
**Weighting** 20%  
**Due Date** To be advised in Canvas.  
**Submission Method** In Class  
 Online  
**Assessment Criteria** To be provided in Canvas.  
**Return Method** Not Returned  
**Feedback Provided** In Person. On an individual basis upon request.

### Assessment 5 - Final examination

**Assessment Type** Formal Examination  
**Purpose** Demonstrate the theoretical understanding and the application of the taught principles.  
**Description** Formal written exam during the exam period.  
**Weighting** 50%  
**Length** 2 hours  
**Due Date** During the formal examination period.  
**Submission Method** Formal Exam  
**Assessment Criteria** To be provided on Canvas.  
**Return Method** Not Returned  
**Feedback Provided** In Person. On an individual basis upon request.

## ADDITIONAL INFORMATION

**Grading Scheme** This course is graded as follows:

| Range of Marks | Grade                 | Description   |
|----------------|-----------------------|---|
| 85-100         | High Distinction (HD) | Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.         |
| 75-84          | Distinction (D)       | Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives. |
| 65-74          | Credit (C)            | Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.           |
| 50-64          | Pass (P)              | Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory  |

|      |           |   |
|------|-----------|---|
|      |           | development of skills*; and achievement of all learning outcomes.   |
| 0-49 | Fail (FF) | Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action. |

\*Skills are those identified for the purposes of assessment task(s).

**Communication Methods**

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.

**Course Evaluation**

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

**Oral Interviews (Vivas)**

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

**Academic Misconduct**

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

**Adverse Circumstances**

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:

<https://policies.newcastle.edu.au/document/view-current.php?id=236>.

**Important Policy Information**

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at

<https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

## Graduate Profile Statements

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers):

| UON Att. | University of Newcastle Bachelor of Engineering Graduate Profile Statements/<br>Engineers Australia Stage 1 competency statements   | Taught | Practised | Assessed | Skill Level (1-4) |
|----------|---|--------|-----------|----------|-------------------|
|          | <b>Professional Attributes</b>  |        |           |          |                   |
| 11       | 3.1. Ethical conduct and professional accountability  |        |           |          |                   |
| 12       | 3.2. Effective oral and written communication in professional and lay domains.  | ☑      | ☑         | ☑        | 1 & 2             |
| 13       | 3.3. Creative, innovative and pro-active demeanour.   |        |           |          |                   |
| 14       | 3.4. Professional use and management of information.  |        |           |          |                   |
| 15       | 3.5. Orderly management of self, and professional conduct.  |        |           |          |                   |
| 16       | 3.6. Effective team membership and team leadership.   |        |           |          |                   |
|          | <b>Engineering Ability</b>  |        |           |          |                   |
| 7        | 2.1. Application of established engineering methods to complex engineering problem solving.   | ☑      | ☑         | ☑        | 1 & 2             |
| 8        | 2.2. Fluent application of engineering techniques, tools and resources.   | ☑      | ☑         | ☑        | 1 & 2             |
| 9        | 2.3. Application of systematic engineering synthesis and design processes.  |        |           |          |                   |
| 10       | 2.4. Application of systematic approaches to the conduct and management of engineering projects.  |        |           |          |                   |
|          | <b>Knowledge Base</b>   |        |           |          |                   |
| 1        | 1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. | ☑      | ☑         |          | 1 & 2             |
| 2        | 1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.         | ☑      | ☑         |          | 1 & 2             |
| 3        | 1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.  | ☑      | ☑         | ☑        | 1 & 2             |
| 4        | 1.4. Discernment of knowledge development and research directions within the engineering discipline.  | ☑      | ☑         | ☑        | 1 & 2             |
| 5        | 1.5. Knowledge of contextual factors impacting the engineering discipline.  |        |           |          |                   |
| 6        | 1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.                            |        |           |          |                   |

*This course outline was approved by the Head of School on 28th November 2023. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.*

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