School of Engineering

ELEC2132: Electric Energy Systems

Singapore PSB

Trimester 3 - 2023 (Singapore)

COURSE OUTLINE

OVERVIEW

Course Description

This course introduces the theory of magnetic circuits, transformers and electromagnetic energy conversion and applies these fundamental principles to systems which rely on them. Topics considered may include three phase circuits, magnetic circuits, transformers, electromechanical energy conversion, transmission lines and power systems.

Academic Progress Requirements

Nil

Assumed Knowledge

ELEC1310 (previously ELEC1300) and ELEC2320

Contact Hours

Singapore PSB
Laboratory *
Face to Face On Campus
15 hour(s) per term starting Week 4

Lecture
Face to Face On Campus
3 hour(s) per week(s) for Full Term starting Week 2
A recording of the Lecture will be available online

Tutorial
Face to Face On Campus
1 hour(s) per week(s) for Full Term starting Week 2
No tutorials will be held in week 1

* This contact type has a compulsory requirement.

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.

CONTACTS

Course Coordinator

Singapore PSB
Prof Andrew Fleming
Andrew.Fleming@newcastle.edu.au
+61 2 4921 6493
Consultation: by email.

Teaching Staff

Other teaching staff will be advised on the course Canvas site.

School Office

School of Engineering (Callaghan)
SENG-ADMIN@newcastle.edu.au
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SYLLABUS

Course Content

Maxwell's Equations

Three phase circuits
- Balanced and unbalanced circuits
- Power

Magnetic circuits
- Magnetic fields
- MMF
- Magnetic flux
- B-H characteristics

Transformers
- Ideal and practical transformer
- Transformer characteristics

Electromechanical energy conversion
- Energy stored in a magnetic field
- Inductance
- Electromagnetic force
- Elementary concepts in rotating machines

Electromagnetic actuators
- Relays
- Solenoids

Transmission Line Modelling
- Transmission line parameters
- Transmission line models
- Wave equation

Power System Representation
- Per Unit System
- Analysis

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Identify the theory necessary to analyse magnetic circuits.

2. Recognise the principles of electromagnetic energy conversion.

3. Apply the fundamental theories to the operating principles of and to model.
    a. Transformers;
    b. Relays and solenoids;
    c. Transmission lines.

4. Interpret AC circuit theory in relation to three phase circuits in steady state, balanced and unbalanced.

5. Recognise the nature of power losses in major elements of an electromagnetic system.

6. Combine elements into a complete system and perform elementary analysis of the system as a whole.

7. Perform power and efficiency calculations for major components of the electromagnetic system and for the system as a whole.

8. Identify and adopt safe practices when working with electric systems containing energy conversion elements.

Course Materials

Recommended Text:

- D.J. Glover, M.S. Sarma "Power Systems analysis and design", 621.31 GLOV
- M.S. Sarma, "Electric Machines: Steady-state theory and dynamic performance", 621.31042

Required Reading:

- ELEC2132 Course Notes published on Canvas.
- ELEC2132 lecture materials updated on Canvas weekly.

COMPULSORY REQUIREMENTS

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

Contact Hour Requirements:

- Laboratory Induction Requirement - Students must attend and pass the induction requirements before attending these sessions. *The Laboratory Safety Induction will be completed in the first lab session*.

ASSESSMENTS

This course has 4 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Online tests	Weeks 2, 5, 6, 11, 12	Individual	15%	1, 2, 3, 4, 5, 7
2	Lab Reports	Friday 5pm the week after your scheduled lab session (or when you attended the lab).	Group	15%	1, 2, 3, 5, 7, 8
3	Mid Semester Quiz	Friday, 27th October (Week 8)	Individual	20%	1, 2, 3, 4, 5
4	Formal Examination	During formal examination period	Individual	50%	1, 2, 3, 4, 5, 6, 7

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 - Online tests

Assessment Type	Online Learning Activity
Purpose	To provide regular feedback on student learning of subject matter.
Description	Each major topic will be concluded by an online mini test, 5 tests in total
Weighting	15%
Length	90 Minutes
Due Date	Weeks 2, 5, 6, 11, 12
Submission Method	Online Tests are completed online in Canvas
Assessment Criteria	Correctness and understanding of subject matter
Return Method	Online
Feedback Provided	Online - Immediately after the test.

Assessment 2 - Lab Reports

Assessment Type	Tutorial / Laboratory Exercises
Purpose	To experimentally validate and observe concepts presented during lectures and other course material.
Description	One report per group, 4 lab reports in total. The first lab is a Lab Safety Induction and will be assessed individually via an online test in Canvas at the end of lab 1.
Weighting	15%
Length	2 - 4 pages
Due Date	Friday 5pm the week after your scheduled lab session (or when you attended the lab).
Submission Method	Online Submit online in Canvas
Assessment Criteria	Correct answers to specific questions, and demonstration of engineering knowledge in long answer questions.
Return Method	Online
Feedback Provided	In Class - 2 weeks after submission.

Assessment 3 - Mid Semester Quiz

Assessment Type	Quiz
Purpose	To provide formal feedback and assessment of student learning in Week 8.
Description	In class quiz during Week 8 lecture.
Weighting	20%
Length	1 Hour, 50 Minutes
Due Date	Friday, 27th October (Week 8)
Submission Method	In Class Submit in class
Assessment Criteria	Correctness of short answer questions, and engineering knowledge demonstrated in long answer questions
Return Method	In Class
Feedback Provided	Returned Work - Week 10.

Assessment 4 - Formal Examination

Assessment Type	2 hr on-campus invigilated Formal Examination
Purpose	Summative feedback of student learning on topics presented during lectures, tutorials, and lab sessions.
Description	Formal written examination held during examination week
Weighting	50%
Length	120 minutes
Due Date	During formal examination period
Submission Method	Formal Exam
Assessment Criteria	Correctness of answers and demonstration of engineering judgement
Return Method	Not Returned
Feedback Provided	In Person - On request and by appointment.

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).

Attendance

Attendance/participation will be recorded in the following components:

- Laboratory (Method of recording: Checked by a lab demonstrator)

WH&S Requirements

Complete Lab Induction

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/no-room-for/policies-and-procedures that support a safe and respectful environment at the University.

Graduate Profile Statements – ELEC2132 – Trimester 3 2023

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/ Engineers Australia Stage 1 competency statements	Taught	Practised	Assessed	Skill Level (1-4)
	Professional Attributes				
11	3.1. Ethical conduct and professional accountability				
12	3.2. Effective oral and written communication in professional and lay domains.	X	X	X	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.				
	Engineering Ability				
7	2.1. Application of established engineering methods to complex engineering problem solving.	X	X	X	1 & 2
8	2.2. Fluent application of engineering techniques, tools and resources.	X	X	X	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.				
	Knowledge Base				
1	1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	X	X		1 & 2
2	1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	X	X		1 & 2
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	X	X	X	1 & 2
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.	X	X	X	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 30th August 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.