School of Engineering

ELEC2320: Electrical and Electronic Circuits

Singapore PSB

Trimester 2 - 2024 (Singapore)

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

COURSE OUTLINE

OVERVIEW

Course Description

This course explores the fundamental concepts of electrical circuits. Content includes mesh/loop analysis (with super meshes), nodal analysis (with super nodes), Thevenin, Norton and maximum power transfer and superposition theorem applied to circuits, circuits based on ideal operational amplifiers, simple non-linear circuits employing diodes and transistors. These include basic amplifiers, buffers and switching circuits.

Academic Progress Requirements

Nil

Requisites

To enrol in this course students must have successfully completed either ELEC1300 or ELEC1310.

Assumed Knowledge

It is anticipated students are studying MATH2310 concurrently or have completed it.

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.

CONTACTS

Course Coordinator

Singapore PSB
Dr Yanan Liu
Yanan.Liu@newcastle.edu.au
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
+61 2 4921 5798

SYLLABUS

Course Content

1. Motivation for formal circuit analysis techniques. Mesh/loop analysis containing super meshes. Nodal analysis containing super nodes. Network analysis.
2. Analysis of circuits using KVL, KCL and circuit theorems (superposition, Thevenin, Norton, maximum power transfer)
3. First order passive filters, second order resonant (RLC) circuits. Energy transfer between passive elements. Q factor. Series and parallel resonances. Applications of resonant circuits. Frequency response.
4. Commonly used sensors in instrumentation circuits.
5. Ideal operational amplifier characteristics. Common and useful circuits using operational amplifiers, amplifiers and active filters.
6. Introduction to diodes, transistors and simple nonlinear circuits employing diodes and transistors including amplifiers, voltage followers, current sources and switching circuits.

Course Learning Outcomes

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

1. Analyse circuits using node and mesh analysis

2. Apply circuit theorems in practical work

3. Design and analyse circuits containing ideal operational amplifiers

4. Design filters and analyse circuits in the frequency domain

5. Analyse simple non-linear circuits containing discrete components such as diodes and transistors

Course Materials

Required Reading:

- Introduction to Electric Circuits – Dorf and Svoboda
- Microelectric Circuits – Sedra and Smith

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	6 May	Course introduction, review, network theorems, applications and analysis	Lecture, Tutorial	
2	13 May	Network theorems, applications and analysis	Lecture, Tutorial Lab - LT Spice Simulation	
3	20 May	Operational amplifiers - circuits, analysis and building blocks	Lecture, Tutorial Lab - Lab 1	Online Quiz 1
4	27 May	AC circuit analysis, phasors, tuned circuits, resonance and transients	Lecture, Tutorial Lab - Lab 1	Lab 1
5	3 Jun	Frequency response analysis, elementary filters, Bode plots, dynamic op amp circuits	Lecture, Tutorial Lab - Lab 2	Online Quiz 2
6	10 Jun	Frequency response analysis, elementary filters, Bode plots, dynamic op amp circuits	Lecture, Tutorial Lab - Lab 2	Lab 2
Recess				
7	24 Jun	Frequency response analysis, elementary filters, Bode plots, dynamic op amp circuits	Lecture, Tutorial	Online Quiz 3
8	1 Jul	Filter design	Lecture, Tutorial	
9	8 Jul	Bipolar junction transistors and applications	Lecture, Tutorial Lab - Lab 3	Online Quiz 4
10	15 Jul	Bipolar junction transistors and applications	Lecture, Tutorial Lab - Lab 3	Lab 3
11	22 Jul	Diode circuits	Lecture, Tutorial Lab - Project	
12	29 Jul	Spare/Review	Lecture, Tutorial Lab - Project	Online Quiz 5
13	5 Aug	Spare/Review	Lecture Lab - Project	Project
Exams				
Exams				

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	Laboratories	See course schedule	Pair	15%	1, 2, 3, 4, 5
2	Design Project	See course schedule	Pair	20%	1, 2, 3, 4, 5
3	Quiz	See course schedule	Individual	15%	1, 2, 5
4	Formal Examination	Exam period	Individual	50%	1, 2, 3, 4, 5

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 - Laboratories

Assessment Type	Tutorial / Laboratory Exercises
Purpose	Gain practical experience on the topics discussed in the course, with particular emphasis on operational amplifier and transistor circuits
Description	3 Labs - each lab contributes 5% toward the final grade
Weighting	15%
Length	See course schedule
Due Date	See course schedule
Submission Method	In Class
Assessment Criteria	Available in the lab marking rubrics on Canvas
Return Method	In Class
Feedback Provided	In Class
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 2 - Design Project

Assessment Type	Project
Purpose	The purpose of the project activity is to develop problem based learning skills; develop oral communication skills and the ability to record data; learn to analyse a problem and synthesise a solution; present results in a clear, well presented and articulate manner.
Description	Design and prototype practical circuits using knowledge gained throughout the course.
Weighting	20%
Length	See course schedule
Due Date	See course schedule
Submission Method	In Class
Assessment Criteria	Available in the project marking rubric on Canvas
Return Method	In Class
Feedback Provided	In Class
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 3 - Quiz

Assessment Type	Quiz
Purpose	Allows students to test their understanding of the topics covered in the lectures.
Description	5 online individual quizzes The links to the quizzes will be made available under the assessment folder in Canvas Each quiz will contribute 3% toward the final grade
Weighting	15%
Length	See course schedule
Due Date	See course schedule
Submission Method	Online
Assessment Criteria	To be provided on Canvas.
Return Method	Online
Feedback Provided	Online
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 4 - Formal Examination

Assessment Type	Formal Examination
Description	Examine the students' knowledge on the contents of the course.
Weighting	50%
Due Date	Exam period
Submission Method	Formal Exam
Assessment Criteria	The Final Exam will examine all material presented in lectures, tutorials and laboratories.
Return Method	Not Returned
Feedback Provided	No Feedback
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

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.

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.

This course outline was approved by the Head of School on the 4th April 2024. 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.

Graduate Profile Statements – ELEC2320

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	2
13	3.3. Creative, innovative and pro-active demeanour.		x	x	2
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	2-3
8	2.2. Fluent application of engineering techniques, tools and resources.	x	x	x	2-3
9	2.3. Application of systematic engineering synthesis and design processes.		x	x	2-3
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	x	3
2	1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	x	x	x	2
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	x	x	x	2
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.		x	x	3
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.				