School of Engineering

ELEC2430: Circuits and Signals

Singapore PSB

Trimester 2 - 2024 (Singapore)

COURSE OUTLINE

OVERVIEW

Course Description

This course starts from the frequency dependent behaviour of alternating current circuits and filters, and shows how Fourier series and Fourier Transform can be used to analyse a circuit's response. Subsequently, differential models and linear system interpretation of linear circuits are discussed, and the first and second order transient behaviour of circuits is analysed using Laplace transforms. Some fundamental concepts of system theory such as transfer functions, impulse response and convolution are introduced. The course also covers the basic building blocks of a digital system including sampling, frequency domain analysis and elementary filters.

Academic Progress Requirements

Nil

Assumed Knowledge

ELEC1310 Introduction to Electrical Engineering, MATH1120 Mathematics for Engineering, Science and Technology 2

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)
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SYLLABUS

Course Content

- Steady state sinusoidal response
- Periodic, non-sinusoidal excitation in systems and Fourier series
- Non-periodic excitation and Fourier transforms
- Fourier-based signal analysis
- Examples of other linear systems governed by differential equations
- Computation of the response of linear systems via Laplace Transform techniques
- Relationship between Laplace and Fourier transforms
- Transfer function, impulse response, convolution, convolution theorems
- Sampling, Nyquist theorems
- Frequency domain analysis of discrete-time signals and systems
- Elementary digital filters
- Basic building blocks for processing analog signals in digital domains

Course Learning Outcomes

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

1. Use Fourier methods to analyse circuits and signals in frequency domains

2. Analyse the physical processes governed by linear equations using basic techniques of linear system theory

3. View linear circuits as examples of linear systems

4. Apply Laplace transform techniques to compute the responses of linear circuits and systems driven by commonly encountered signals

5. Apply sampling theory to properly sample analog signals for digital processing in computers

6. Design simple digital signal processing systems

Course Materials

Lecture Materials:

- Lecture notes available on Canvas.

Recommended Reading:

- Edward W. Kamen and Bonnie S. Heck, Fundamentals of Signals and Systems – using the web and MATLAB, Third Edition, Pearson – Prentice Hall 2007.

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Laboratory exercises x 4	Due week 4, 6, 8 and 10	Group	30%	1, 3, 4, 5, 6
2	Quiz	Week 6 and Week 10	Individual	30%	1, 2, 3, 4
3	Examination	During Formal Examination period.	Individual	40%	1, 2, 3, 4, 5, 6

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 - Laboratory exercises x 4

Assessment Type Tutorial / Laboratory Exercises
Purpose The purpose of laboratory activity is to enable peer-to-peer learning; develop oral communication skills and the ability to record data, synthesise an opinion and convey this clearly in a well presented and articulate manner.
Description The laboratory exercises are practical applications of the concepts presented in lectures and tutorials.
Weighting 30%
Due Date Due week 4, 6, 8 and 10
Submission Method Online
Assessment Criteria See individual lab descriptions in Canvas.
Return Method In Class
Feedback Provided In Person
Opportunity to Reattempt Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 2 - Quiz

Assessment Type Quiz
Purpose The purpose and benefit of the class quizzes is to provide the students with regular feedback on student learning. The test highlights areas of concern and may stimulate discussion with tutors and lecturers.
Description There will be two quizzes, weighing 15% each.
Weighting 30%
Due Date Week 6 and Week 10
Submission Method In Class
Assessment Criteria To be advised in 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 - Examination

Assessment Type Formal Examination
Purpose The final formal examination is designed to test the individual student's knowledge of the course material and their ability to describe, analyse and hypothesise from this material.
Description 120 Minutes long comprising of long-answer questions similar to tutorials and quizzes.
Weighting 40%
Due Date During Formal Examination 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 In Person

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 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 Statement

	University of Newcastle Bachelor of Engineering Graduate Profile Statements	Taught	Practised	Assessed	Level of capability
	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.	☑	☑		**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.				
	Engineering Ability				
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.				
	Professional Attributes				
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.				