EEEN203 Analogue Circuits and Systems

Course Outline Trimester 1 2024

Prescription

This course covers the analysis of analogue electrical and electronic circuits. Topics covered include basic circuit theorems, operational amplifier circuits, the use of phasors for AC circuit analysis and the Laplace transform for switched systems. The use of computational and measurement tools for circuit characterisation is also covered.

Course learning objectives

Students who pass this course should be able to:

1. Formulate differential equation-based models of analogue circuits containing passive components and operational amplifiers. (BE graduate attribute 3(a, c))
2. Use a range of circuit analysis techniques to find unknown voltages, currents and power. (BE graduate attribute 3(a))
3. Apply phasor and Laplace transform based circuit analysis techniques. (BE graduate attribute 3(b))
4. Describe, measure and characterise first and second order systems in the frequency domain. (BE graduate attribute 3(b))
5. Competently use electronic test equipment to measure analogue circuit performance. (BE graduate attribute 3(d, e, f))
6. Use industry standard software tools for the analysis of measured circuit data and simulate analogue circuit performance. (BE graduate attribute 3(f))
7. Understand magnetic materials and analyse circuits that use transformers.

Lecturers

The lecturer and co-teacher for the course and their contact details are:

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Chris Hollitt

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Teaching Format

During the first trimester 2024, there will be two lectures, one tutorial and lab each week.

Dates (semester, teaching & break dates)

In 2024 VUW academic calendar, the course starts from Monday, 26th February 2024 to Sunday, 23rd June 2024 (e.g. 12 weeks of teaching and learning, semester breaks, study and exam periods).

Class Times and Room Numbers

- Lecture: Tuesday, 11:00-11:50, Easterfield Building, Room 120, Kelburn and Wednesday, 11:00-11:50, Easterfield Building, Room 120, Kelburn.
- Tutorial: Friday, 11:00-11:50, Easterfield Building, Room 120, Kelburn.
- Computer Laboratory: Mondays 9am, CO249, Cotton Building, Kelburn (see the detail lab schedules).

In summary, there are 2 x 50 minutes lectures, 1 x 50 minutes tutorial, and 2 hours demo/laboratory that will be held respectively each week in the course.

Set Texts and Recommended Readings

Suggested

There are no required texts for this course. Most of the references in the lectures, labs and assignments are taken from:

- Nilsson & Riedel, Electric Circuits, 10th Edition.

Recommended

Since there is no required textbook for course, however, supplemental reading of a relevant textbook to complement lectures, assignments, and tests is strongly encouraged. Course notes will also be available to complement lectures, but are generally not sufficient to replace them. The list below are the recommended textbooks (note: the contents of these books are very similar with each other):

- Hayt, Kemmerly & Durbin, Engineering Circuit Analysis, 8th Edition.
- Alexander & Sadiku, Fundamentals of Electric Circuits, 5th Edition.

See Appendix for outlines of the topics covered in the course and their relevant sections and parts in the recommended textbooks.

Mandatory Course Requirements

In addition to achieving an overall pass mark, students should achieve at least D in the exam and

midterm test and submit all assignments and labs.

If you believe that exceptional circumstances may prevent you from meeting the mandatory course requirements, contact the Course Coordinator for advice as soon as possible.

Assessment

A large part of this course involves the mastery of knowledge and skills essential for progression in the ECEN/ELCO specialisation of the BE/BSc degree programmes at VUW. Hence, most of the assessment will be via:

- Two term tests, each of 1 hour duration, will be held in week 5 and 12 respectively.
- Two assignments exploring the application of knowledge and skills taught in the course to be submitted in the end of weeks 5 and 12.
- Five laboratory reports at weeks 2-12. These lab reports are worth 3%, 8%, 3%, 4%, and 4%. Activities in these laboratories will reinforce and illustrate material covered in lectures.
- Tutorials will be given out throughout the semester and relevant questions and case studies will be discussed in the lecture.
- Materials from laboratories and tutorials will be expected to be assessed in the tests.

Assessment	**Time**	**Learning Outcomes**	**Weight**
Assignments (2)	Week 5 & 12	CLO: 1, 2, 3, 4 and 7	30%
Laboratories (5)	Weeks 2-12	CLO: 5, 6, and 7	22%
Tests (2)	Week 5 & 12	CLO: 1, 2, 3, 4 and 7	48%

Submission & Return

Submit completed assignments and labs to the course wiki website and to the lecturer during class time. Work submitted late will be penalised at 10%/day. Work submitted more than a week late will not be marked.

Individual extensions will only be granted in exceptional personal circumstances, and should be negotiated with the course coordinator before the deadline whenever possible. Documentation (e.g., medical certificate, official request letter, etc.) may be required.

Workload

In order to maintain satisfactory progress in the course, you should plan to spend an average of 9-10 hours per week on this course. A plausible and approximate breakdown for these hours would be:

- Lectures and tutorials: 4 hrs
- Readings: 1 hr
- Assignments and labs: 3 hrs

- Practice questions: 1-2 hrs

Teaching Plan

The attached table shows the details of teaching schedule in the course. See also details of the course schedule for submissions and dates.

Communication of Additional Information

The main means of communication outside of lectures will be the EEEN203 wiki website of the School of Engineering and Computer Science at the Victoria University of Wellington, emails and class representation.

https://ecs.wgtn.ac.nz/Courses/EEEN203_2024T1/LectureSchedule

Links to General Course Information

- Academic Integrity and Plagiarism: https://www.victoria.ac.nz/students/study/exams/integrity-plagiarism
- Academic Progress: https://www.victoria.ac.nz/students/study/progress/academic-progress (including restrictions and non-engagement).

Appendix

The following table outlines the planned topics covered in the course and their relevant sections and parts in the recommended textbooks (i.e. subject to changes during the semester).

Topic	Lecture	Tutorial	Textbook	Section/Part	Page
1. DC Analysis	1a. Revision	Tutorial 1	Nilsson & Riedel	Chapter 1	11-14
			Nilsson & Riedel	Chapter 2	26-33
			Nilsson & Riedel	Chapter 3	58-75
	1b. Kirchhoff laws		Nilsson & Riedel	Chapter 2	37-41
	1c. Nodal Analysis	Tutorial 2	Nilsson & Riedel	Chapter 4	93-98
	1d. Mesh Analysis		Nilsson & Riedel	Chapter 4	99-108
	Solution to Linear Equations		Nilsson & Riedel	Appendix A	705-724
	1e. Thevenin/Norton		Nilsson & Riedel	Chapter 4	109-119
	1f. Superposition		Nilsson & Riedel	Chapter 4	122-128
2. AC analysis	2a. Capacitor	Tutorial 3	Nilsson & Riedel	Chapter 6	
	2b. Inductor		Nilsson & Riedel	Chapter 6	
	2c. AC analysis		Nilsson & Riedel	Chapter 7	214-235
	2d. Impedance		Nilsson & Riedel	Chapter 9	308-320
	2e. Passive Filters		Nilsson & Riedel	Chapter 14 & Chapter 15	524-550 (Ch. 14), 560-593 (Ch. 15)
	2f. Integrator-Differentiator		Nilsson & Riedel		
	2g. Transformer		Nilsson & Riedel	Chapter 9	334-343

3. Amplifiers	3a. Operational Amplifier	Tutorial 4	Nilsson & Riedel	Chapter 5	146-149
	3b. Application of Op Amp		Nilsson & Riedel	Chapter 5	150-158
	First-Half Revision				
4. Frequency Response and Resonance Circuits	4a. Frequency Dependent Circuits	Tutorial 5	Alexander & Sadiku	Chapter 14	583-631
			Nilsson & Riedel	Appendix E	741-757
	4b. First-Order Circuits		Nilsson & Riedel	Chapter 7	214-263
	4c. Second-Order (Resonant) Circuits		Nilsson & Riedel	Chapter 8	560-593
5. Laplace Transforms	5a. Introduction to Laplace Transform	Tutorial 6	Nilsson & Riedel	Chapter 12	430-459
	5b. Further Laplace Transforms		Nilsson & Riedel	Chapter 12	430-459
6. Laplace transform application in Circuits	6a. Solving DE with Laplace Transforms	Tutorial 7	Nilsson & Riedel	Chapter 13	469-505
	6b. Circuits and Systems Analysis and Design with Laplace Transform		Nilsson & Riedel	Chapter 13	469-505
7. Single-phase circuits	7a. Power and Transformers	Tutorial 8	Nilsson & Riedel	Chapter 10	358-395
	7b. Electric Power		Course Notes		
	7c. Power Factor		Course Notes		

8. Three phase circuits	8a. Three Phase	Tutorial 9	Nilsson & Riedel	Chapter 11	396-425
	8b. Further Three Phase				
	Second-Half Revision				