ELEC275

Nonlinear Circuits and Devices

S1 Day 2018

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff
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Credit points
3

Prerequisites
(ELEC270 or ENGG270) and MATH235

Corequisites

Co-badged status
This unit is co-badged with ELEC675

Unit description
This unit builds on ELEC270 and introduces frequency dependence and active circuit elements in theory and in the laboratory. It further develops the concepts of time-domain versus frequency-domain analysis, and Bode plots. Amplifier circuits including operational-amplifier-based circuits are introduced. The nonlinear elements in this unit include diodes and transistors, and their large-signal time domain analysis, leading to their small-signal analysis.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Be proficient in analysing linear circuits with resistors, capacitors and inductors using dc and ac methods

Understand the design principles of circuits with operational amplifiers

Apply nonlinear circuit analysis concepts to circuits with diode elements

Understand and analyse dc and ac circuits with bipolar-junction transistors

Apply dc and ac analysis to circuits with field-effect transistors

Be proficient with constructing and measuring circuits in the laboratory based on the design principles

General Assessment Information

Notifications

Formal notification of assessment tasks, grading rubrics and due dates will be posted on iLearn. Although all reasonable measures to ensure the information is accurate, The University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

Weekly Plan

A weekly plan of lectures, assignments, tests, laboratory and workshop sessions will be posted on iLearn. Students are expected to consult it and be aware of possible minor variations.

Assignment Tasks

Assignment questions will be posted on iLearn at least two weeks before their submission date. Assignment solutions will be posted within one to three days after the submission date. Submissions will not be accepted once the solution is posted.

All assignments must be submitted electronically through iLearn (in pdf format). Submissions are expected to be neatly written (or typed) in a logical layout and sequence. Markers WILL NOT grade poorly organized or illegible scans or drafts. The expected workload includes preparation of final copies and clear diagrams. Resubmissions will be permitted up to due date.

All assignments should be prepared individually. It is expected that students consult tutors, lecturers or other students while learning the concepts, but copying assignments from others is not accepted. Students are expected to have read and understood the academic honesty policy.

Absences

Late notices or absences from tests, workshops and laboratories will be considered under extenuating circumstances upon lodgement and approval of a formal notice of disruption of studies.

Grading

In order to pass this unit a student must obtain a mark of 50 or more overall or obtain a passing grade P/ CR/ D/ HD.

Late submissions

Late submissions of assignment or lab reports will not be allowed unless a formal disruption of studies has been submitted. Assignment solutions will be posted to iLearn two days after submission. After solutions are posted no more late submissions will be accepted.

Assessment Tasks

Name	Weighting	Hurdle	Due
Laboratory	25%	No	Check iLearn
Assignments	10%	No	Check iLearn
In-class tests	25%	No	Check iLearn
Final exam	40%	No	Will appear in exam calendar

Laboratory

Due: **Check iLearn**
Weighting: **25%**

Practical sessions start in Week 2. They are comprised of laboratory or problem-solving-workshop sessions linked to each learning outcome; and they are compulsory for all students. Students are expected to arrive on time and use the laboratory time efficiently. Students should enroll to one practical class at the beginning of the semester. Switching a practical class during semester is not possible unless a formal application of "disruption to studies" is approved.

All practical sessions are based on the learning outcomes of this unit and students are required to review the concepts introduced in lectures before coming to each session. Laboratory or workshop worksheets will be posted on iLearn prior to the weekly sessions and it is compulsory for students to complete the preparatory work before coming to the session.

Each student must have a bound notebook to be used as a logbook (A4 size preferred, graph pages are not required). This logbook should be used for all practical work including preliminary and post (reflection) work. It should contain dates, calculations and results recorded during these sessions, in time order. On the completion of each session, logbook entries must be signed and dated by a tutor. Logbooks must be kept in good order for a final check at the end of the semester.

Food and drink are not permitted in the laboratory. Students will not be permitted to enter the laboratory without appropriate footwear. Thongs and sandals are not acceptable.

On successful completion you will be able to:

- Understand the design principles of circuits with operational amplifiers

- Apply nonlinear circuit analysis concepts to circuits with diode elements
- Understand and analyse dc and ac circuits with bipolar-junction transistors
- Apply dc and ac analysis to circuits with field-effect transistors
- Be proficient with constructing and measuring circuits in the laboratory based on the design principles

Assignments

Due: **Check iLearn**
Weighting: **10%**

Questions to be solved at home on the concepts particular learning outcomes and to be submitted electronically to iLearn. Details of each assignment will be updated on iLearn.

On successful completion you will be able to:

- Understand the design principles of circuits with operational amplifiers
- Apply nonlinear circuit analysis concepts to circuits with diode elements
- Understand and analyse dc and ac circuits with bipolar-junction transistors
- Apply dc and ac analysis to circuits with field-effect transistors

In-class tests

Due: **Check iLearn**
Weighting: **25%**

A short invigilated test in class on particular learning outcomes. Details will be updated on iLearn.

On successful completion you will be able to:

- Be proficient in analysing linear circuits with resistors, capacitors and inductors using dc and ac methods
- Understand the design principles of circuits with operational amplifiers
- Apply nonlinear circuit analysis concepts to circuits with diode elements
- Understand and analyse dc and ac circuits with bipolar-junction transistors
- Apply dc and ac analysis to circuits with field-effect transistors

Final exam

Due: **Will appear in exam calendar**
Weighting: **40%**

A closed-book 3-hour exam will be conducted in the formal examination period. A formula sheet will be provided.

On successful completion you will be able to:

- Understand the design principles of circuits with operational amplifiers
- Apply nonlinear circuit analysis concepts to circuits with diode elements
- Understand and analyse dc and ac circuits with bipolar-junction transistors
- Apply dc and ac analysis to circuits with field-effect transistors

Delivery and Resources

Textbooks

1. A. D. Sedra and K. C. Smith, "Microelectronic circuits", 4th edition or higher (1982 or newer)
2. A. R. Hambley, “Electrical Engineering, Principles and Applications, International Sixth Edition,” Pearson, 2014.

Technology used: Typical electronic and electrical laboratory instruments such as voltage and current sources, voltmeters, ammeters, oscilloscopes, simulation software AWR will be used.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/student-conduct

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where

relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Be proficient in analysing linear circuits with resistors, capacitors and inductors using dc and ac methods
- Understand the design principles of circuits with operational amplifiers
- Apply nonlinear circuit analysis concepts to circuits with diode elements
- Understand and analyse dc and ac circuits with bipolar-junction transistors
- Apply dc and ac analysis to circuits with field-effect transistors
- Be proficient with constructing and measuring circuits in the laboratory based on the design principles

Assessment tasks

- Laboratory
- Assignments
- In-class tests
- Final exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Understand the design principles of circuits with operational amplifiers
- Apply nonlinear circuit analysis concepts to circuits with diode elements
- Understand and analyse dc and ac circuits with bipolar-junction transistors
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Assessment tasks

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Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcome

- Be proficient with constructing and measuring circuits in the laboratory based on the design principles

Assessment task

- Laboratory

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcome

- Be proficient with constructing and measuring circuits in the laboratory based on the design principles

Assessment tasks

- Laboratory
- Assignments
- In-class tests
- Final exam

Changes since First Published

Date	Description
26/02/2018	This unit is co-badged with ELEC675 and all the content needs to be made available to the ELEC675 students