ELEC376

Electronic Devices and Systems

S2 Day 2018

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff
Unit Convener, Lecturer
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Credit points
3

Prerequisites
(39cp at 100 level or above) including ELEC275

Corequisites

Co-badged status
ELEC676

Unit description
This unit further develops the topics of analogue circuit theory and practice with an emphasis on design. It covers semiconductor devices, circuit simulations, basic transistor amplifiers, operational-amplifier circuits and some more advanced topics which may include noise and non-linear design issues.

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:

Understand the basic semiconductor devices, their operation and non-linear behaviour
Apply nonlinear device concepts to the design and analysis of transistor amplifiers.
Apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
Analyse the operation of power amplifiers in the time and frequency domains.
Design, simulate, implement, test and debug electronic circuits and systems
Demonstrate self-learning, time-management, project management- individually and in a group.

General Assessment Information

- In order to pass this unit, a student must obtain a mark of 50 or more for the unit. For further details about grading, please refer below in the policies and procedures section.
- Laboratory reports must be submitted on time. Late submissions will attract a penalty of 10% marks per day.
- Extenuating circumstances will be considered upon lodgment of an application for special consideration.
- Resubmissions of work are not allowed

Assessment Tasks

Name	Weighting	Hurdle	Due
Final Closed Book Examination	40%	No	TBA
Laboratory	35%	No	In course
In-class tests	20%	No	TBA
Pre-classroom activities	5%	No	In course

Final Closed Book Examination

Due: **TBA**
Weighting: **40%**

A final closed-book examination (3hrs max) will be conducted during the formal examination period.

This Assessment Task relates to the following Learning Outcomes:

- Understanding various semiconductor devices, their operation and non-linear behaviour

- Ability to apply nonlinear device concepts to the design and analysis of transistor amplifiers.
- Ability to apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Ability to analyse the operation of power amplifiers in the time and frequency domains.

On successful completion you will be able to:

- Understand the basic semiconductor devices, their operation and non-linear behaviour
- Apply nonlinear device concepts to the design and analysis of transistor amplifiers.
- Apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Analyse the operation of power amplifiers in the time and frequency domains.

Laboratory

Due: **In course**
Weighting: **35%**

The experiments are designed to explore the practical aspects of the theory. You will need to perform the experiments and submit reports on these. Lab participation: 15% Lab Reports: 20%

This Assessment Task relates to the following Learning Outcomes:

- Understanding various semiconductor devices, their operation and non-linear behaviour
- Ability to apply nonlinear device concepts to the design and analysis of transistor amplifiers.
- Ability to apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Ability to analyse the operation of power amplifiers in the time and frequency domains.
- Ability to design, simulate, implement, test and debug electronic systems
- Demonstrate self-learning, time-management, project management- individually and in a group.

On successful completion you will be able to:

- Design, simulate, implement, test and debug electronic circuits and systems
- Demonstrate self-learning, time-management, project management- individually and in a group.

In-class tests

Due: **TBA**
Weighting: **20%**

There will be four class-room tests (closed book, written tests) for 0.5 hour each. The class tests will be announced at least one week in advance.

The Assessment task relates to the following learning outcomes:

- Understanding various semiconductor devices, their operation and non-linear behaviour
- Ability to apply nonlinear device concepts to the design and analysis of transistor amplifiers.
- Ability to apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Ability to analyse the operation of power amplifiers in the time and frequency domains.

On successful completion you will be able to:

- Understand the basic semiconductor devices, their operation and non-linear behaviour
- Apply nonlinear device concepts to the design and analysis of transistor amplifiers.
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- Analyse the operation of power amplifiers in the time and frequency domains.

Pre-classroom activities

Due: **In course**
Weighting: **5%**

Students are required to go through the online learning content, understand the basic theory and attempt the online quizzes each week before attending that week's 'Lectorial'. Students can do so at their own pace, time and venue. Please note that the quizzes for the week will close before the start of that week's 'Lectorial'. Students will get two attempts on these quizzes before they close.

On successful completion you will be able to:

- Understand the basic semiconductor devices, their operation and non-linear behaviour
- Apply nonlinear device concepts to the design and analysis of transistor amplifiers.
- Apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Analyse the operation of power amplifiers in the time and frequency domains.

- Design, simulate, implement, test and debug electronic circuits and systems
- Demonstrate self-learning, time-management, project management- individually and in a group.

Delivery and Resources

Recommended texts:

Sedra and Smith- Microelectronic Circuits 6th Edition. The material will also cover other books and journal articles. Reading recommendations will be provided through iLearn.

Technology used:

Typical electronic and electrical instruments such as voltage and current sources, voltmeters, ammeters, oscilloscopes, simulation software such as AWR Microwave Office, ORCAD, PSpice, and typesetting software such as Latex will be used. Access to these resources will be available in the laboratory during the scheduled sessions.

Library and Internet:

Links to resources and literature will be provided in the iLearn.

Unit Schedule

The unit is composed of four modules.

The first module will run for one of two weeks to review the basics of concepts presented in the prerequisite unit, ELEC275.

The subsequent three modules will run for four weeks each and be directly linked to the learning outcomes. Each module will include pre-classroom activities, lectorials, laboratory and tutorial sessions, will be graded against all four assessment tasks listed above.

A detailed schedule will be posted on iLearn.

Learning and Teaching Activities

Directed self study through pre-classroom activities

Resources and links posted on iLearn are expected to be reviewed and studied by all students before each class.

Lectorials

Lectorials introduce students to the advanced level knowledge which builds on what they learned from the pre-classroom activities. This may include creative problem-solving exercises or reviewing the important (or difficult) sections. It will be assumed that information linked in iLearn is studied prior to the lectorial.

Laboratory

Develop skills based competencies in experimentation with overlap/application to theory and simulation. A significant portion of the laboratory effort is expected to be exploration of the posed problem and of operation and setting up of equipment.

Tutorial Workshop

This activity develops the understanding of key concepts through problem based activities and discussion. Interaction, examples, and review is anticipated.

Consulting Hours

The course instructor will be available for consulting. Please check the beginning page of the unit guide for the consulting hours.

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

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Understand the basic semiconductor devices, their operation and non-linear behaviour
- Apply nonlinear device concepts to the design and analysis of transistor amplifiers.
- Apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Analyse the operation of power amplifiers in the time and frequency domains.
- Design, simulate, implement, test and debug electronic circuits and systems
- Demonstrate self-learning, time-management, project management- individually and in a group.

Assessment tasks

- Final Closed Book Examination
- In-class tests

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Design, simulate, implement, test and debug electronic circuits and systems
- Demonstrate self-learning, time-management, project management- individually and in a group.

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcome

- Demonstrate self-learning, time-management, project management- individually and in a group.

Assessment task

- Pre-classroom activities

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

- Understand the basic semiconductor devices, their operation and non-linear behaviour
- Apply nonlinear device concepts to the design and analysis of transistor amplifiers.
- Apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Analyse the operation of power amplifiers in the time and frequency domains.
- Design, simulate, implement, test and debug electronic circuits and systems

Assessment tasks

- Final Closed Book Examination
- Laboratory
- In-class tests
- Pre-classroom activities

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 basic semiconductor devices, their operation and non-linear behaviour
- Apply nonlinear device concepts to the design and analysis of transistor amplifiers.
- Apply mathematical methods to the analysis of nonlinear electronic systems in the

frequency domain.
- Analyse the operation of power amplifiers in the time and frequency domains.

Assessment tasks

- Final Closed Book Examination
- Laboratory
- In-class tests
- Pre-classroom activities

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 outcomes

- Understand the basic semiconductor devices, their operation and non-linear behaviour
- Apply nonlinear device concepts to the design and analysis of transistor amplifiers.
- Apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Analyse the operation of power amplifiers in the time and frequency domains.
- Design, simulate, implement, test and debug electronic circuits and systems

Assessment tasks

- Final Closed Book Examination
- Laboratory
- In-class tests
- Pre-classroom activities

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 outcomes

- Design, simulate, implement, test and debug electronic circuits and systems
- Demonstrate self-learning, time-management, project management- individually and in a group.

Assessment task

- Laboratory

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

- Demonstrate self-learning, time-management, project management- individually and in a group.

Changes from Previous Offering

Pre-classroom activities and In-class tests are introduced. Classroom activities are changed from lectures to lectorials. Lectorials include summarising, reviewing difficult contents, advanced problem solving, critical thinking, discussion etc.