ELEC376

Electronic Devices and Systems

S1 Day 2014

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff
Unit Convenor
Tony Parker
tony.parker@mq.edu.au
Contact via tony.parker@mq.edu.au
E6A 234

Lecturer
Oya Sevimli
oya.sevimli@mq.edu.au
Contact via oya.sevimli@mq.edu.au
E6A 235

Head Tutor
Evgeny Kuxa
evgeny.kuxa@mq.edu.au
Contact via evgeny.kuxa@mq.edu.au

Credit points
3

Prerequisites
39cp including ELEC275(P)

Corequisites

Co-badged status

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

Apply nonlinear device concepts to the design and analysis of single transistor amplifiers.
Ability to apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
Ability to analyse the operation of mixers and frequency convertors in the power and frequency domains.
Ability to analyse the operation of power amplifiers in the power and frequency domains.
Demonstrate self-learning, time-management, and project management, individually and in a group setting

Assessment Tasks

Name	Weighting	Due
Participation and Logging	10%	13/6/2014
Assignments	20%	13/6/2013
Laboratory reports	30%	13/6/2013
Final Exam	40%	30/6/2013

Participation and Logging

Due: **13/6/2014**
Weighting: **10%**

The logbook (experimentation) and the lecture (theory and practical examples) are collected and marked to note the degree of importance of the recording of pertinent information. This is especially importnat to engineers when it comes to patents.

On successful completion you will be able to:

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

Assignments

Due: **13/6/2013**
Weighting: **20%**

Students will have an assignment related to each lecture topic, normally on a weekly basis. A problem will be prepared for the first lecture of the week and then additional problems will need to be completed the following week.

Assignment problems are due 1 week after the final lecture for that topic

On successful completion you will be able to:

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

Laboratory reports

Due: **13/6/2013**
Weighting: **30%**

Laboratories will be given to build up skills in several areas, including but not limited to, the proper advanced use of EDA/CAD tools and circuit design, assembly and test to demonstrate the various phenomena studied in lecture

Reports are due 1 week after each three-week Laboratory block.

On successful completion you will be able to:

- Apply nonlinear device concepts to the design and analysis of single transistor amplifiers.
- Ability to apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Ability to analyse the operation of mixers and frequency convertors in the power and frequency domains.
- Ability to analyse the operation of power amplifiers in the power and frequency domains.
- Demonstrate self-learning, time-management, and project management, individually and in a group setting

Final Exam

Due: **30/6/2013**
Weighting: **40%**

Demonstrate knowledge on lecture and lab/practical material. 3 hour, closed book

On successful completion you will be able to:

- Apply nonlinear device concepts to the design and analysis of single transistor amplifiers.

- Ability to apply mathematical methods to the analysis of nonlinear electronic systems in the frequency domain.
- Ability to analyse the operation of mixers and frequency convertors in the power and frequency domains.
- Ability to analyse the operation of power amplifiers in the power and frequency domains.

Delivery and Resources

This unit emphasizes a dynamic combination of lecture, practical and laboratory work, group and individual project work, and a high degree of self-learning. The overall goal is to emulate the first professional experience the student will have as a new/young engineer in a professional setting.

There will be a high emphasis on use of EDA/CAD tools. Students will need to spend time using on-line, self-teaching materials for mastering these software packages.

Research in the library as to the state of the art in electronics will be required as the student determines deficiencies or opportunities in the project.

Recommended texts:

Coleman, “An Introduction to Radio Frequency Engineering,” Cambridge University Press 2004.

Sedra & Smith, “Microelectronic Circuits,” Cambridge University Press.

Weste and Harris, “CMOS VLSI Design”, Addison Wesley, 3rd edition (2004), or 4th edition, 2011.

Changes made to previous offerings of the unit:

New module structure is introduced where each module is directly linked to the learning outcomes.

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.

Unit Schedule

The unit is composed of four modules. Each module will run for three weeks and be directly linked to the learning outcomes. Each module will include lectures, laboratory and tutorial sessions, one or two assignments and one laboratory report.

A detailed weekly schedule will be posted on iLearn.

Learning and Teaching Activities

Lecture

Delivery of material not previously seen by the students or material which will be presented in a differenct context with regard to graduate capabilities. There may be some review material, but this is minimal

Laboratory

Develop skills based competencies in experimentation with overlap/application to theory and simulation

Workshop

This activity develops the understanding of key threshold concepts through problem based activities and discussion.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of 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/support/student_conduct/

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://informatics.mq.edu.au/help/.

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

Graduate Capabilities

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 outcome

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

Assessment task

- Participation and Logging

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, and project management, individually and in a group setting

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

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

Assessment tasks

- Laboratory reports
- 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

- Apply nonlinear device concepts to the design and analysis of single transistor amplifiers.
- Ability to apply mathematical methods to the analysis of nonlinear electronic systems in

the frequency domain.
- Ability to analyse the operation of mixers and frequency convertors in the power and frequency domains.
- Ability to analyse the operation of power amplifiers in the power and frequency domains.

Assessment tasks

- Assignments
- Laboratory reports
- Final Exam

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

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

Assessment tasks

- Participation and Logging
- Assignments
- Laboratory reports

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

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

Assessment tasks

- Participation and Logging
- Laboratory reports

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

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

Assessment tasks

- Participation and Logging
- Laboratory reports