MONASH University

Unit Guide

ECE5882
Advanced electronics design

Semester 2, 2017

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Unit handbook information

Synopsis

This an advanced unit in electronics design. Students will be provided with an in-depth knowledge of radio frequency (RF) and microwave circuits and systems. The unit builds on students' basic electronic knowledge obtained from their undergraduate engineering degree to a more advanced analog and RF electronics, with more theory and applications of electronics.
The unit will teach students the detailed design principles of passive and active electronic devices at radio frequencies. Students will learn to use CAD design software packages for assignments and projects. Important analogue and RF building components such as amplifiers, filters, oscillators, modulators, mixers and phase locked loops will be taught. Topics such as noise and interference in electronics circuits will also be covered.
Students will undertake a group project where RF/mixed signal circuits will be designed, built and tested in the laboratory.

Mode of delivery

Clayton (Day)

On Campus, Clayton Second semester 2017

Workload requirements

3 hours lectures, 3 hours tutorial/laboratory and 6 hours of private study per week.

3 hours lectures, 3 hours laboratory and practice classes and 6 hours of private study per week

Unit relationships

Prerequisites

The students should have a basic knowledge of electronics and electrical circuit analysis as would typically be covered in undergraduate subjects in these areas.

Prohibitions

None

Co-requisites

None

Chief Examiner(s)

Professor Manos Varvarigos

Unit Coordinator(s)

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Demonstrator(s)

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This is an advanced unit in electronics design. Students will be provided with an in-depth knowledge of analog, radio frequency (RF) and microwave circuits and systems. The unit builds on students' basic electronic knowledge obtained from their undergraduate engineering degree to a more advanced analog and RF electronics, with more theory and applications of electronics.

Academic Overview

Engineers Australia Stage 2 competencies

The Engineers Australia Policy on Accreditation of Professional Engineering Programs requires that all programs ensure that their engineering graduates develop to a substantial degree the stage 2 competencies. Listed below are the activities in this unit that will help you to achieve these competencies.

Note: that not all stage 2 competencies are relevant to each unit.

Stage 2 competencies	Activities used in this unit to develop stage 2 competencies
PE1.1 Knowledge of science and engineering fundamentals	Acquired through lecture material , prescribed texts and recommended reading
PE1.2 In-depth technical competence in at least one engineering discipline	Technical competencies in following areas: Analog/RF electronics, Microwave theory, Circuit design, practical circuit design and testing
PE1.3 Techniques and resources	Analog, RF and microwave circuits and systems design can be learned through a comprehensive set of lectures, tutorials and practical sessions
PE1.4 General knowledge	Problem-based learning can be achieved through laboratory classes and project based self-study that should be completed by students as the practical assessment
PE2.1 Ability to undertake problem identification, formulation, and solution	Acquired through tutorials that promote critical thinking, and a project that requires students to put all the theories they learnt into practice.
PE2.2 Understanding of social, cultural, global, and environmental responsibilities and the need to employ principles of sustainable development	The projects and laboratory work requires students to get an understanding of EMC related issues that are associated with RF design
PE2.3 Ability to utilise a systems approach to complex problems and to design and operational performance	Students are required to complete a complex group project as their practical assessment. This involves applying systems approach to design of a complex electronics circuit.
PE2.4 Proficiency in engineering design	Student get proficiency in following areas through laboratory classes and design projects: Electronic circuit design, hardware, testing of circuits, Altium PCB design
PE2.5 Ability to conduct an engineering project	This is achieved through participation in structured lab sessions and project based assessment
PE2.6 Understanding of the business environment	A basic knowledge of electronic industry in Australia is conveyed to student during lectures
PE3.1 Ability to communicate effectively, with the engineering team and with the community at large	Students are required to work as a team to complete their lab classes and project. They are also required to produce a technical report as a part of the project.
PE3.2 Ability to manage information and documentation	Students are required to obtain information from an extensive set of technical

	documentation in order to successfully complete the project
PE3.3 Capacity for creativity and innovation	Laboratory classes and the project based assessment provides students with the opportunity to be creative and innovative in analogue and RF circuit design
PE3.4 Understanding of professional and ethical responsibilities, and commitment to them PE3.5 Ability to function effectively as an individual and in multidisciplinary and multicultural teams, as a team leader or manager as well as an effective team member PE3.7 Professional attitudes	Team based activities that are promoted through laboratory sessions and projects encourages student to behave in a professional and responsible manner. Efficiency and proper work ethics in a team-based environment are essential for successful completion of these activities
PE3.6 Capacity for lifelong learning and professional development	This subject provides students with initial background that is required to be successful in the field of electronics engineering.

Teaching and learning method

- Lecture and problem solving classes
- Laboratory-based classes

The unit consists of lectures and practice classes with some computer laboratory classes. In addition to lectures, learning in the unit is achieved through the laboratory, and has a number of components, which build to form the final project. The main learning approach is “Problem- based learning” which requires students to be involved with the project and proactive learners.

Laboratory allocation

There are 3-hours of laboratory classes scheduled each week. There is only one laboratory session per week.

Communication, participation and feedback

Monash aims to provide a learning environment in which students receive a range of ongoing feedback throughout their studies. In this unit it will take the form of group feedback via practice classes, individual feedback, peer feedback, self-comparison, verbal and written feedback, discussions in class, as well as more formal feedback related to assignment marks and grades. Students/You are encouraged to draw on a variety of feedback to enhance their/your learning.

Learning outcomes

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

- analyse RF and microwave electronic components, circuits and systems
- design and implement RF and mixed signal electronic devices
- formulate, plan, create, document, validate and simulate RF and mixed signal electronic designs with the effective use of appropriate modern CAD design software tools

- test and characterise RF and microwave electronics using appropriate test equipment

Your feedback to us

One of the formal ways students have to provide feedback on teaching and their learning experience is through the Student Evaluation of Teaching and Units (SETU) survey. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied with and areas for improvement.

Previous student evaluations of this unit

In response to previous SETU results of this unit, the following changes have been made:

We will add a few more problems at the end of each lecture. These problems will make sure students will understand the concept of electronics better.

Student feedback has highlighted the following strength(s) in this unit:

Students were happy with the unit in the last SETU. Many positive comments were received. e.g. contents were inspiring, labs were very good, all important concepts of electronics were covered, the unit is handled well etc.

If you wish to view how previous students rated this unit, please go to:
https://unitevaluations.connect.monash.edu.au/unitevaluations/index.jsp

Unit schedule

Week	Activities	Assessment
1 26th July	Introduction & Lecture-1: Passive and Active Devices	
2 2 Aug.	Lecture 2: Analysis of Electronic Systems: Noise, Linearity, Dynamic Range Lab 1: Spice Simulation	
3 9 Aug.	Lecture 3: Transmission Lines Lab 2: Passive Components	
4 16 Aug.	Lecture 4: Smith Chart, RF RLC Circuits and Network Analysis Lab 3: Noise in Electronics	
5 23 Aug.	Lecture 5: RF Amplifiers, LNAs and Mixers, Lab 4: Altium	
6 30 Aug.	Lecture 6: Oscillators-Theory and Design Lab 5: ADS Lab	
7 6 Sept.	Lecture 7: Phase Locked loops (PLLs)-I, Lab 6: Mixers	Assignment due 08 September (Friday, 5 pm)
8 13 Sep.	Lecture 8: PLLs-II Lab 7: Oscillators	
9 20 Sept	Lecture 9: Analog and RF Filters Lab 8: PLL	
10 4 Oct.	Lecture 10: Wideband Analog Amplifiers /Instrumentation Amplifiers, Sensing Circuits	Group Design Project

	Lab: Project Design Session	
11 11 Oct.	Project Help Desk Lab: Project Design Session	Group Design Project
12 18 Oct.	Revision Lecture Lab: Project Design Session	Group Design Project (Due 20 October Friday, 5 pm)
	SWOT VAC 23 Oct - 27 Oct	No formal assessment is undertaken in SWOT VAC
	Examination period 30 Oct - 17 Nov	LINK to Assessment Policy: www.policy.monash.edu/policy bank/academic/education/asse ssment/assessment-in-coursework-policy.html

Assessment requirements

Assessment summary

Continuous assessment: 50%
Examination (2 hours): 50%
Students are required to achieve at least 45% in the total continuous assessment component (assignments, tests, mid-semester exams, laboratory reports) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

Assessment task	Value	Due date
Circuit design with Spice	10%	Week 7 (08 September, Friday, 5 pm)
Design Project	20%	20 October, Friday, 5 pm.
Labs	20%	At the end of each lab session
Examination	50%	To be advised

Hurdle requirements

Students are required to achieve at least 45% in the total continuous assessment component (assignment, group project and laboratory) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this

requirement will be given a maximum of 45% in the unit

Participation

Students are required to attend the laboratory sessions for obtaining LAB marks.

Assessment tasks

Assessment title: Circuit design with Spice
Mode of delivery: Not applicable
Details of task: Not applicable
Release dates (where applicable): Week 6
Word limit (where applicable): N/A
Due date: Week 7 (08 September, Friday, 5 pm)
Value: 10%
Presentation requirements: Not applicable
Hurdle requirements (where applicable): It is a part of the hurdle set for the total continuous assessments.
Individual assessment in group tasks (where applicable): Not applicable
Criteria for marking: Circuits should operate as per performance requirements requested in the assignment.
Additional remarks: Estimated return date is Week 7

Assessment title: Design Project
Mode of delivery: Not applicable
Details of task: Not applicable
Release dates (where applicable): Week 9
Word limit (where applicable): 15 pages
Due date: 20 October, Friday, 5 pm.
Value: 20%
Presentation requirements: Not applicable
Hurdle requirements (where applicable): It is a part of the hurdle set for the total continuous assessments.
Individual assessment in group tasks (where applicable): Yes
Criteria for marking: See the project document that will be distributed during semester.
Additional remarks: Estimated return date is Week 12

Assessment title: Labs
Mode of delivery: Not applicable
Details of task: Students are required to attend the laboratory sessions for obtaining LAB marks.
Release dates (where applicable): Not applicable
Word limit (where applicable): Not applicable
Due date: At the end of each lab session
Value: 20%
Presentation requirements: Not applicable
Hurdle requirements (where applicable): It is a part of the hurdle set for the total continuous assessments.
Individual assessment in group tasks (where applicable): Not applicable
Criteria for marking: Not applicable
Additional remarks: Not applicable

Examination(s)

Exam title: Examination
Weighting: 50%
Length: 2 hours
Type (Open/closed book): Open book
Hurdle requirements (where applicable): *Students are required to achieve at least 45% in the final examination component.*
Electronic devices allowed: Calculator
Remarks (where applicable): Not applicable

Calculators
Any make or model of calculator is permitted to be used in this examination.

Examination material or equipment

Students are allowed to bring textbooks, notes and lecture material to the examination venue.

Extensions and penalties

Please note that there will be no extensions to the submission deadlines.

Returning assignments

Students should submit project reports in Week 12.

Resubmission of assignments

Resubmission is allowed only if students provide a medical certificate.

Plagiarism and collusion

Intentional plagiarism or collusion amounts to cheating under Part 7 of the Monash University (Council) Regulations.

Plagiarism: Plagiarism means taking and using another person's ideas or manner of expressing them and passing them off as one's own. For example, by failing to give appropriate acknowledgement. The material used can be from any source (staff, students or the internet, published and unpublished works).

Collusion: Collusion means unauthorised collaboration with another person on assessable written, oral or practical work and includes paying another person to complete all or part of the work.

Where there are reasonable grounds for believing that intentional plagiarism or collusion has occurred, this will be reported to the Associate Dean (Education) or delegate,

Referencing requirements

All the literature on reports should be properly cited using IEEE referencing format.

To build your skills in citing and referencing, and using different referencing styles, see the online tutorial Academic Integrity: Demystifying Citing and Referencing at http://www.lib.monash.edu.au/tutorials/citing/

Assignment submission

Hard Copy Submission:

Assignments must include a cover sheet. The coversheet is accessible via the Monash portal page located at http://my.monash.edu.au under the heading 'Learning and teaching tools'. Please keep a copy of tasks completed for your records.

Please submit your hardcopy of the project report to the mail box of Mehmet Yuce (1 st floor/72, close to the ECSE office).

Online Submission: If Electronic Submission has been approved for your unit, please submit your work via the Moodle site or other; as directed by your demonstator for this unit.
Please keep a copy of tasks completed for your records.

In addition to the hardcopy submission, email your reports to the lecturer or the lab demonstrator.

Feedback to you

Feedback to the student will be through written comments, verbal comments, and feedback to the whole class.

Learning resources

Prescribed textbooks

Main Text Books:

- **C. Coleman**, *An Introduction to Radio Frequency Engineering Cambridge, 2004, ISBN: 0 521 83481 3. –**Main Book***
- **Reinhold Ludwig** and **Pavel Bretchko** “RF Circuit Design: Theory and Application”, Prentice-Hall, (2000). ISBN: 0-13-095323-7 (New version of this book is also acceptable). –**Alternative book**

Additional reference book:

- **Thomas H. Lee,** " The design of CMOS Radio-Frequency Integrated Circuits," Cambridge 2 nd edition, ISBN: 0521835399

These books are available from Monash library, with some copies available for online reading.

http://readinglists.lib.monash.edu/lists/8176B42B-A812-282C-6956-6E0EF4532FFE.html

Monash Library Unit Reading List (if applicable to the unit):
http://readinglists.lib.monash.edu/index.html

Required resources

Students generally must be able to complete the requirements of their course without the imposition of fees that are additional to the student contribution amount or tuition fees. However, students may be charged certain incidental fees or be expected to make certain purchases to support their study. For more information about this, go to Administrative Information for Higher Education Providers: Student Support, Chapter 21, Incidental Fees at: http://www.innovation.gov.au/HigherEducation/TertiaryEducation/ResourcesAndPublications/Pages/default.aspx

Technological requirements

Students must regularly check Moodle for announcements. Students are allowed to bring their own laptops and tablets to the lab sessions.

Other information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:
http://www.policy.monash.edu/policy-bank/academic/education/index.html

Graduate Attributes Policy

http://www.monash.edu/policy-bank/academic/education/course-governance-and-design/course-design-policy

Student Charter

http://www.monash.edu/students/policies/student-charter.html

Student Services

The University provides many different kinds of services to help you gain the most from your studies. Contact your tutor if you need advice and see the range of services available at: http://www.monash.edu/students

Monash University Library

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research.
Go to http://www.monash.edu/library or the library tab in http://my.monash.edu.au portal for more information.

Disability Support Services

Students who have a disability, ongoing medical or mental health condition are welcome to contact Disability Support Services.

Disability Support Services also support students who are carers of a person who is aged and frail or has a disability, medical condition or mental health condition.

Disability Advisers visit all Victorian campuses on a regular basis.

- Website: monash.edu/disability
- Telephone: 03 9905 5704 to book an appointment with an Adviser;
- Email: disabilitysupportservices@monash.edu
- Drop In: Level 1, Western Annexe, 21 Chancellors Walk (Campus Centre) Clayton Campus