

ELEC2133 – ANALOGUE ELECTRONICS

COURSE INTRODUCTION - SESSION 1, 2009

COURSE STAFF

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COURSE DETAILS

Units of Credit: This is a 6 UoC course; expected workload is 10-12 hours per week throughout the 12 week session.

Contact Hours: The course consists of 3 hours of lectures per week, as well as a 1 hour tutorial and a 2 hour laboratory session every second week.

Lectures:	Tue	14:00 - 16:00	
	Thu	09:00 - 10:00	
Tutorials:	Mon	11:00 - 12:00	
	Thu	10:00 - 11:00	
Labs:	Thu	11:00 - 14:00	(Weeks: 3, 5, 7, 9, 11)
	Fri	13:00 - 16:00	(Weeks: 2, 4, 6, 8, 10)
	Fri	13:00 - 16:00	(Weeks: 3, 5, 7, 9, 11)

AIMS AND SCOPE

The aim of this subject is to further develop skill and knowledge in the analysis and design of electronic circuits. The conceptual knowledge gained in second-year electronics will be applied to specific use in real circuits. The first half of the course will focus on the design and analysis of multi-stage linear amplifiers/operational amplifiers in terms of its frequency response, effects of feedback and stability. The second half deals with non-linear circuits like Schmitt triggers, comparators, waveform generators and building blocks for electronic communication circuits, like A-D and D-A

converters. This subject endeavours to teach students not only just how to solve circuit problems but also develop a more thorough understanding of why circuits behave in a certain way and how performance can be improved. The topics to be covered include the following:

- Frequency analysis of amplifiers.
- Design and analysis of feedback amplifiers.
- Amplifier stability analysis.
- Operational amplifiers and comparators.
- Schmitt trigger circuits.
- Waveform generators.
- Analogue-to-digital and digital-to-analogue converters.

RELATION TO OTHER COURSES

Prerequisites: The prerequisite for Analogue Electronics is ELEC2134 (Circuits and Signals). Students are strongly advised to revise any unfamiliar topics in their own time.

Following Courses: This course is a prerequisite for the third year course ELEC3106 Electronics. It is also a prerequisite for fourth year elective courses in the area of electronics; ELEC4601 Digital and Embedded Systems Design, ELEC4602 Microelectronics Design and Technology, ELEC4603 Solid State Electronics and ELEC4604 RF Electronics.

LEARNING OUTCOMES

After completing this course, students will be expected to:

1. Be able to perform frequency analysis on multi-stage linear amplifiers/operational amplifier circuits.
2. Understand the effects of feedback and stability in amplifier circuits.
3. Have a basic understanding of the semiconductor devices used in electronics and the physics behind them.
4. Understand, analyse and to some extent be able to design non-linear circuits like Schmitt triggers, comparators and waveform generators.
5. Be familiar with the basics of A-D and D-A converters.

The course delivery methods and course content address a number of core UNSW *graduate attributes*; these include:

1. The capacity for analytical and critical thinking and for creative problem-solving, which is addressed by the laboratory and tutorial exercises.
2. The ability to engage in independent and reflective learning, which is addressed by the assignment tasks and laboratories.
3. The skills of effective communication, which are addressed by the laboratory reports and assignment tasks.

Please refer to <http://www.ltu.unsw.edu.au/content/userDocs/GradAttrEng.pdf> for more information about graduate attributes.

TEACHING STRATEGIES

The course consists of the following elements: lectures, laboratory work, home work, and tutorials:

Lectures: The lectures provide the students with a focus on the core material in the course. Numerous examples of analogue amplifier circuits and non-linear circuits (e.g. waveform generators) are discussed. It is essential that students attend every lecture. Lecture notes will be progressively made available on the course WebCT website, but they're no substitute for the lectures.

Laboratory Work: The laboratory work provides the student with hands-on experience in measuring basic analogue circuits and helps to re-enforce core topics. Most of the laboratory work being carried out on bread boards constructed by the students, also exercises the students ability to set up measurements and locating and debugging circuit errors. Students must come prepared for all laboratory sessions.

Tutorials: The tutorials provide students with an in-depth quantitative understanding of analogue circuit analysis. The tutorials take the student through critical course topics and aim to exercise the students circuit analysis skills. These tutorials will be used to discuss the tutorial questions, which will be available for download from the course WebCT. Tutorials will commence in the **third week** of the session. You need only attend one tutorial each fortnight.

ASSESSMENTS

Assessments in this subject will be based on the following scheme:

Laboratory (Compulsory Experiments 1 & 2)	20%
Assignments (2)	10%
Final Exam	70%

You must pass both the laboratory component and the exam component to attain an overall pass in the course.

LABORATORY WORK

Electronics is very much an experiment-oriented subject. Successful practical implementation of designs and effective reporting of results are of crucial importance in developing your skills as a competent electronics engineer.

A pass grade in Experiments 1 and 2 is required to pass this subject. Each experiment contributes 10% to the overall course mark.

The preliminary preparation for each laboratory experiment must be completed before the relevant laboratory session. The circuits to be constructed have values that depend on the results of the design carried out in the preliminary work. You will not be able to construct the circuit correctly without having completed the preliminary preparation.

Keeping systematic notes is an important aspect of experimental technique. Your laboratory notebooks should be the primary record of your design and calculations and results of your experiments. The preliminary preparation should be done in the laboratory notebook. Results,

measurement and observations should be recorded directly into the notebook as they are gathered (and not on loose scraps of paper). Except when drawing circuits and waveforms, pen must be used rather than pencil. There is no need to do a 'draft' and then a 'good copy' – this merely wastes time.

Laboratory notes should be downloaded from the subject website. The experiments are:

- | | | |
|--------|---|-----------------|
| exp 1. | Operational Amplifier – compulsory | (2 lab-periods) |
| exp 2. | Feedback Amplifier – compulsory | (2 lab-periods) |

Laboratory sessions are scheduled every alternate week, i.e., you attend a laboratory period every odd week or every even week, depending on your lab allocation. Lab classes with section code ending in B or E are scheduled for even weeks, and those with section ending in A or D are scheduled for odd weeks. Laboratory work officially commences in **week 2** (even week) of session, with the groups scheduled for lab classes on even weeks.

Please take careful note of the **laboratory experiment completion deadlines**, as outlined in Section 7.2.

LABORATORY ARRANGEMENT

Students are required to provide their own breadboard, inscribed with their student number, to each laboratory session. Construction and testing of all circuits must be carried on his/her own breadboard. **Using another student's breadboard is regarded as infringement of university examination regulations.** Breadboards may be purchased from the workshop in G24. A pair of needle-nose pliers and wire strippers would also be useful.

You are expected to work on the experiment **on your own** and copying is an infringement of university examination regulations. Discussion on experimental work is encouraged, but over zealous assistance should be avoided.

DEADLINE FOR MARKING OF LABORATORY WORK
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The **deadline** is the **scheduled day** of your laboratory session in the weeks 6/7 and 10/11 for Experiments 1 and 2 respectively, L1 and L2 in the table below. Your experimental work must be written up and marked by this date, **even if you have not completed the entire laboratory exercise.** A penalty will be applied once the deadline has elapsed. **10 points** will be deducted for each fortnight late – note that you may only be assessed for a laboratory experiment in the lab session you are enrolled in. Even if you have no points left, **you must still satisfactorily complete the laboratory work to pass the course.**

WEEK	Week beginning	Thu Odd	Fri Even	Fri Odd
1	9 th March			
2	16 th March			
3	23 rd March			
4	30 th March			
5	6 th April			
MID SESSION RECESS				

6	20 th April		L1	
7	27 th April	L1		L1
8	4 th May			
9	11 th May			
10	18 th May		L2	
11	25 th May	L2		L2
12	1 st June			

Students are strongly encouraged to start Experiment 2 on the lab session when Experiment 1 is marked.

ASSESSMENT OF LABORATORY WORK

- (i) All preliminary preparation, results of experimental measurements and discussion of results **must be neatly recorded** in a laboratory book. **Work presented in loose sheets will NOT be marked.**
- (ii) **Assessment of your work will be conducted orally.** It is the student's responsibility to organise the documentation of his laboratory work in a fashion that shows his/her understanding and achievements. During the oral examination, **students are expected to demonstrate the operation of their circuit.** Do not dismantle the circuit until you have received a written clearance in your laboratory note book that the assessment is complete.
- (iii) Each experiment will be marked out of **20 points.**
- (iv) Marking will only be done during the laboratory period by the demonstrators present. It is the responsibility of the students to make sure that his/her mark is recorded by the demonstrator. Experiments will only be marked during a student's assigned lab time. Do not attend another lab group to get marked.

LABORATORY ATTENDANCE

Attendance at scheduled laboratory classes is mandatory. Should a class be missed for medical reasons, a medical certificate must be presented, upon which the student will be allowed to make up the missed laboratory class in another lab class.

No student will be permitted to work in a laboratory class in which s/he is not enrolled, except on medical grounds.

ASSIGNMENTS

There will be two compulsory written **assignments** for this course, which will be released on the course WebCT. Each assignment will be worth 5% of the overall mark for this course. It is expected that the students complete assignments on their own.

RESOURCES

Textbook: Sedra & Smith, *Microelectronic Circuits*, 5th ed., Oxford University Press, 2003.

You may find the following reference books helpful:

1. Millman & Grabel, *Microelectronics*, McGrawHill, 2nd ed., NY.
2. Burns & Bond, *Principles of Electronic Circuits*, PWS, 2nd ed., 1997.
3. Higgins, *Electronics with Digital and Analog Integrated Circuits*, 1983.
4. Bogart, *Electronic Devices and Circuits*, 3rd ed., Merrill, 1993.
5. Horowitz & Hill, *The Art of Electronics*, 2nd ed., Cambridge University Press, 1989.

Website: The WebCT Vista portal will be the primary point of contact, for administrative matters, with the student. Any important announcements will be placed on the 'Announcements' page, which the student is obliged to check regularly. Lecture notes, tutorial questions, lab notes, assignments and other course materials will also be made available for download from WebCT.

Those unfamiliar with WebCT should consult the following website, which contains instructions and other resources for students <http://support.vista.elearning.unsw.edu.au/content/default.cfm?ss=0>.

PLAGIARISM

Students found guilty of academic misconduct, in particular plagiarism - including excessive collaboration, copying another's assignment, or allowing one's assignment to be copied by another student - will not receive any marks for that assignment. In addition, any plagiarism will be referred to the Head of School for further action. Plagiarism is considered a serious offence by the University and severe penalties may apply. For more information about plagiarism, see <http://www.lc.unsw.edu.au/plagiarism/index.html>.

CONTACT INFORMATION

All queries or concerns about Analogue Electronics should be directed, in the first instance, to the Teaching Assistant at jarryd@student.unsw.edu.au. Please ensure that the subject line of any e-mail sent is informative and includes the word 'ELEC2133'.