



Faculty of Engineering

School of Electrical Engineering & Telecommunications

ELEC 2133

Analogue Electronics

SUMMER SESSION, 2014-2015

ELEC2133 – ANALOGUE ELECTRONICS

SUMMER SESSION – 2014-2015

COURSE STAFF

Course convenor:

Prof. Chee Yee KWOK
Room 242
cy.kwok@unsw.edu.au

Lab Demonstrators:

Astria Irfansyah
Md. Rahman (Jan)/Neil Wang (Feb)

Tutor:

Prof. Kwok/Rachpon Kalra

Consultations:

Prof. Kwok will be your main source of assistance for ELEC2133. Please direct all communication to him. He will be available online regularly and will be providing a consultation time for which students can discuss technical and other issues in the course. Please identify yourself in your queries.

COURSE DETAILS

Contact Hours:

The course consists of pre-recorded lecture videos provided for online download. There will be an introduction-compulsory session at the first week on Monday 01/12/14 to explain how the course runs and what is expected from the student. It will be held at QUAD032 from 2pm-4pm. Apart from that, contact hours are restricted to Week 4, and 8 of the session for labs and tutorials only. There are 18 hours of lab and 14 hours of tutorial in total.

The summer session officially runs over two periods, Period A from 02/12/13-10/01/14, and Period B from 13/01/14-07/02/14.

Introduction-compulsory:

Week 1
Monday (2pm-4pm) -01/12/13
Location: QUAD032

Tutorials:

	<u>Week 3</u>			
16/12/2014	12pm-2pm	QuadG032	Rachpon Kalra	
	<u>Week 4</u>			
6/01/2015	12pm-2pm	G24	Prof. Kwok	
8/01/2015	12pm-2pm	QuadG032	Prof Kwok	
9/01/2015	12pm-2pm	G24	Prof. Kwok	

	<u>Week 8</u>		
3/02/2015	12pm-2pm	G24	Rachpon Kalra
5/02/2015	12pm-2pm	QuadG032	Rachpon Kalra
6/02/2015	12pm-2pm	QuadG032	Rachpon Kalra

Laboratories:

Week 4

Monday (2pm-5pm)- 05/01/15
 Tuesday (9am-12pm)- 06/01/15
 Thursday (2pm-5pm)-08/01/15
 Location: **EE 101**

Week 8

Monday (2pm-5pm) - 02/02/15
 Tuesday (9am-12pm) - 03/02/15
 Thursday (2pm-5pm) - 05/02/15
 Location: **EE 101**

Mid-session test:

Week 5

Friday (1pm-2:30pm)- 15/01/15
 Location: **TBA**

COURSE INFORMATION

Aims and scopes:

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

Pre-requisites:

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

Course web site:

The course website is at <http://moodle2.telt.unsw.edu.au>. It will be a primary point of contact, for administrative matters, with the student. Any important announcements will be posted on the 'News forum' page, which the student is obliged to check regularly. Links to lecture videos, lecture notes, tutorial questions, lab notes, assignments and other course materials will also be made available for download from Moodle.

You will need your student z-pass to log on. It is important that you check Moodle several times per week.

Those unfamiliar with Moodle should consult the following website, which contains instructions and other resources for students <http://telt.unsw.wikispaces.net/Moodle>. There is also online tutorial available on Moodle once you log in.

References:

The textbook set for this course is:

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

Additionally, 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.

Learning outcomes and attributes:

After the successful completion of the course, the student will be able to:

1. Understand the basics of analog circuit design and its limitations.
2. Developed an intuitive feel for circuits analysis and design.
3. Analysis of analog circuits to determine frequency response, stability and feedback topologies.
4. Analyse and understand the behaviour of oscillators.

Contribution of course to graduate attributes:

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 assignments, laboratory and tutorial exercises.
2. The ability to engage in independent and reflective learning, which is addressed by the lectures, assignments, tutorials and laboratory work.
3. The skills of effective communication, which are addressed by the lab reports and oral assessments.

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

TEACHING STRATEGIES

Delivery mode:

The teaching strategies employed in this course are different, in so far as the lectures will not be face-to-face, but provided as pre-recorded videos available for online download. The lectures have been recorded by Prof. Chee Yee Kwok in the running of ELEC2133 in previous years. Tutorials and laboratories are carried out in “block-mode”, where students are required to attend in weeks 3,4,8, where they will undertake all labs and tutorials in an intensive fashion.

Course Schedule:

There are 24 lecture videos. The odd numbered lecture videos last for 2hours while the even ones run for an hour. It is recommended that you view the lecture videos in the manner suggested in the following table. The table also shows major topics covered in the lecture videos. You may need to refer to this table every time to make sure that you are not lagging behind.

Week	Major Topics	Lecture videos	Work Load for lecture video, tutorial and laboratory (in hour)
1 (1-5 Dec)	Review(circuits, and frequency analysis) (1), operational amplifiers (2,3), and Semiconductor devices for electronics (3,4,5)	1,2,3,4,5	8hr (Lecture videos)
2 (8-12 Dec)	Transistor amplifier: small signal analysis and DC biasing(6,7,8,9,10)	6,7,8,9,10,11	9hr(Lecture videos)
3 (15-19 Dec)	Frequency response of amplifiers (11,12,13) and Extra materials on Frequency response	11,12,13, 23	7hr (Lecture videos)
4 (5-9 Jan)			2hr (Lecture videos) + 7hr (Tut) + 9hr (Lab)
5 (12-16 Jan)	Feed back in amplifiers (14,15,16,17)	14,15,16,17	6hr (Lecture videos)
6 (19-23 Jan)	Feedback stability and compensation (18,19), Non-linear circuits (19,24), Digital-Analog Interface (20,21,22)	18,19,24,20,21	7hr(Lecture videos)
7 (26-30 Jan)	Digital-Analog Interface (20,21,22)	22	1hr (Lecture video) + 2hr (Tut)
8 (2-6 Feb)	----	-----	6hr (Tut) + 9hr (Lab)

Lectures:

The entire course will be delivered in a new mode of teaching, using pre-recorded video lecture presentations. You will need to watch these video lectures in your own time well before the tutorials and labs in Weeks 3, 4, 7 and 8. Advantages of the video recordings are:

- You will be able to watch them at your own pace.
- You can revisit the lecture content as many times as you like.
- Things that you might miss in a normal live lecture (e.g. difficult mathematical concepts) are available on the recording.

It is essential that students view all lectures. Lecture notes will be progressively made available on Moodle.

Note that not all video recordings will be released at once. Upon downloading and viewing a set of lectures, students will be required to undertake a small quiz on Moodle before being allowed to proceed to the next lecture set. These quizzes ARE assessable and WILL contribute to your final grade. They are to ensure that students are viewing the lecture recordings.

Laboratories:

Laboratory work

- There is **NO** lab exemptions for summer courses.
- Students will be required to **work in pairs** on the experiments. You are expected to apply yourself fully to the experimental work and not just rely on your partner. Demonstrators will be able to observe this. Demonstrators will assess your laboratory work individually (not as pairs)
- Electronics is very much an experiment-oriented course. 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, 2 and 3 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 course website. The experiments are:

Experiment 1: **Operational Amplifier — compulsory** (nominally 2 x 3hr lab-periods)

Experiment 2: **Feedback Amplifier — compulsory** (nominally 2 x 3hr lab-periods)

Experiment 3: **Waveform Generation — compulsory** (nominally 2 x 3hr lab-periods)

- Laboratory sessions are scheduled in Weeks 4, and 8 as detailed in the *Contact hours*. Please take careful note of the **laboratory experiment completion deadlines**, as outlined in laboratory deadlines section below.

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 in pairs and copying is an infringement of university examination regulations. Discussion on experimental work is encouraged, but overzealous assistance should be avoided.

Laboratory deadlines

- The following deadlines exist for Experiments 1,2 and 3:

Experiment 1: Monday, Week 4, 08/01/15

Experiment 2: Thursday, Week 4, 03/02/15

Experiment 3: Tuesday, Week 8, 05/02/15

- 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 3hr lab period. Even if you have no points left, **you must still satisfactorily complete the laboratory work to pass the course**.

Students are strongly encouraged to start the next experiment in the lab session when the previous experiment is marked.

Laboratory assessment criteria

(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 **100 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 who will be asking relevant questions about the experiment to you're your **UNDERSTANDING**.

Laboratory attendance

Attendance at scheduled laboratory classes is mandatory. Should a class be missed for medical reasons, a medical certificate must be presented.

Tutorials:

Tutorials are scheduled for Weeks 3,4 and 8 as outlined in the *Contact hours*. These tutorials will be used to discuss the tutorial questions, which will be available for download from the Moodle for the course.

Students are required to attend the tutorials. Not all of tutorial problems will be discussed during tutorial sessions as the contact time is limited. However, students are encouraged to attempt all the tutorial questions in advance. Students who can demonstrate that they have attempted tutorial questions, for example, by actively participating during the tutorial sessions will get bonus marks.

Assessments:

You are expected to view all lectures, and attend all tutorials, labs and quizzes, in order to maximize learning. It is a UNSW requirement that you attend at least 80% of your classes. **As the tutorial contact times are limited, it is important to prepare your tutorial questions in advance of attending the tutorial classes.** Similarly, in order to finish all the laboratory activities within the scheduled laboratory time table, you need to be organised by preparing yourself well before your laboratory classes.

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

Laboratory (Experiment 1, 2 & 3)	20%
Assignments (2)	15%
Assignment 1 due on Week 6, Mon January 19	
Assignment 2 due on Week 9, Mon February 09	
Mid-session test 15 th January 2015	10%
Final Exam 13 th February 2015 EE224	<u>55%</u>
Total	<u>100%</u>

There are five main components to the overall assessment, namely:

1. **Laboratory assessment:** there will be three experiments in the laboratory. Each experiment should be finished within two lab sessions. You will be assessed by the demonstrator at the end of every two lab sessions for each experiment. You should remember that you **MUST PASS** the laboratory assessment in order to have any chance of passing the course **AND** you have to attend at least 80% of the lab. Repeating students are **NOT EXEMPTED** from the laboratory assessment.
2. **Assignment:** There are also two compulsory written **assignments** for this course, which will be released on the course Moodle after Week 2 and 5 respectively. The assignments will be worth 15% of the overall mark in total for this course. It is expected that the students complete assignments on their own. Assignment submission is set in Week 6 on January 19 for Assignment 1 and the end of Week 9 on 9th Feb for Assignment 2.
3. **Mid-session test:** there will be a 1.0 hour quiz during session as scheduled above. All students, including repeating students, should sit for the test.
4. **Final exam:** there will be a closed book 3 hour final exam. You **MUST PASS** the final exam to pass the subject.

Note: For all class assessment tasks, if the student is unable to attend for medical or other serious reasons (e.g. death in the family) the student must present medical certificates and/or other relevant documentations within 3 days of the assessment to the course convener. If this is not done within the required time period, then no consideration will be given. In the case of missing a quiz/test for one of the reasons above, the assessment will be carried over to the final exam, i.e the final exam will become a higher % of the assessment.

OTHER MATTERS

Academic honesty and plagiarism:

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.* Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne.

Contact Information:

All queries or concerns about Analogue Electronics should be directed to a.michael@unsw.edu.au. Please ensure that the subject line of any e-mail sent is informative and includes the word 'ELEC2133'.

Course improvement:

This course is continually under review and constructive student feedback is always valued. Periodically student evaluative feedback on the course is gathered, using among other means, UNSW's Course and Teaching Evaluation and Improvement (CATEI) Process. Student feedback is taken seriously, and continual improvements are made to the course based in part on such feedback.

Administrative Matters:

It is important that students familiarise themselves with all the School of Electrical Engineering and Telecommunications policy and procedures. These are available at:

<http://scoff.ee.unsw.edu.au/information/information.htm>

The major information headings are listed below.

Information for Current Students

USE OF EE&T FACILITIES

- [Laboratory Regulations and Safety](#)
- [Evacuation Procedures](#)
- [OHS](#)
- [First Aid](#)

ACADEMIC ISSUES

- [The Learning experience](#)
- [Submission of Written Work](#)
- [Resubmission](#)
- [Late Submission](#)
- [Plagiarism and Academic Honesty](#)
- [UNSW Examination Rules](#)
- [Special Consideration, Illness and Misadventure](#)
- [EE&T Supplementary Assessment Policy](#)
- [Supplementary Examinations](#)
- [Attendance](#)
- [Conduct](#)
- [Academic Standing](#)
- [Grading](#)
- [Grievance Procedures](#)

Equity and diversity: those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or www.equity.unsw.edu.au/disabil.html). Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made. Information on designing courses and course outlines that take into account the needs of students with disabilities can be found at:

www.secretariat.unsw.edu.au/acboardcom/minutes/coe/disabilityguidelines.pdf