ELEC2134
Circuits and Signals
Course Outline – Summer Session 2016

Never Stand Still | Faculty of Engineering | School of Electrical Engineering and Telecommunications

Course Staff

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Consultations: Your mentor and tutor will be your main source of assistance for ELEC2134. Please direct all communication to her in the first instance. Your mentor will be available online via the Moodle learning management system regularly and will be providing consultation times for which students can discuss technical and other issues in the course. Any and ALL email enquiries should be made from your student email address with ELEC2134 in the subject line otherwise they will not be answered.

Keeping Informed: Announcements may be made during classes, via email (to your student email address) and/or via online learning and teaching platforms – in this course, we will use Moodle https://moodle.telt.unsw.edu.au/login/index.php. Please note that you will be deemed to have received this information, so you should take careful note of all announcements.

Course Summary

Contact Hours

The summer session officially runs over two periods, Period A from 28/11/16-16/12/16, and Period B from 3/01/17-13/02/17. Please make sure that you will be available for the entire summer session periods and there are no supplementary exams for ELEC/TELE summer session courses.

Contact hours are restricted to certain weeks of session for labs and tutorials only. There are 26 hours of lab and 18 hours of face-to-face tutorial in total.

Lectures:	The course consists of pre-recorded lecture videos provided for online download. There will be an introduction lecture held Wednesday November 30 from 12:00am-2pm in Chemical Sciences Mezzanine M11.
Tutorials:	Week 3, 4 and Week 7, 8 only See timetable in Moodle
Laboratories:	Week 4 and Week 7, 8 only See timetable in Moodle

Context and Aims

Electrical Engineering is concerned with three primary activities: the first deals with electricity and its direct control and use within electrical circuits (they are used for power systems, electronics, instrumentation, communications and so on). The second activity is concerned with modelling systems which use electricity as the primary source of energy for functioning. The third activity concerns the handling of data which relies on electrical phenomena (wired and wireless) for data transmission. This course provides the fundamental techniques for

carrying out the first two activities.

This course aims to:

- Provide a basic understanding of electronic components on which analysis and design of electronic circuits and systems are based, including operational amplifiers.
- Provide the ability to formulate and solve the differential equations describing the time behaviour of the first and second order circuits.
- Provide the capability to design and construct circuits, take measurements of circuit behaviour and performance, compare with predicted circuit models and explain discrepancies.
- Introduce a systems-based approach for solving linear circuits using the Laplace and Fourier transforms.

Indicative Lecture Schedule:

Period	Summary of Lecture Program	Ref (Chapters)
Week 1	Background, Ohm's Law, Methods of Circuit Analysis	1, 2, 3
Week 1	Circuit Theorems	4
Week 2	Capacitors , Inductors and Operational Amplifiers	5, 6
Week 3	Transient response in first order RLC circuits	7
Week 3	Transient response in second order RLC circuits	8
Week 3	Sinusoidal signals, sinusoidal steady-state analysis of circuits	9, 10
Week 5	AC Power Analysis	11
Week 5	Magnetically coupled circuits	13
Week 6	Frequency Response, transfer function, Resonant circuits	14
Week 6	Introduction to Laplace transform, Applications and state variables	15, 16
Week 7	Fourier Series and Fourier Transform	17, 18
Week 7	Two-Port Networks, Revision	19

Indicative Lab Schedule:

Period	Summary of Lab Program
Week 4 Week 5	Introduction to Elvis and PSpice (not to be marked) Using Matlab and PSpice for Circuit Analysis Checkpoint 1 Superposition Theorem Checkpoint 2 Step Response of an RLC circuit and RLC Series Circuit Resonance Checkpoint 3
Week 8	Introduction to operational amplifiers and Op-amp filters Checkpoint 4 Network synthesis Checkpoint 5

Course Details

Credits

Course ELEC2134 is 6 UOC with an expected average workload of approximately 16 hours per week during session.

Relationship to Other Courses

This course builds directly on the year 1 course in Electrical Engineering ELEC1111/ELEC1112, which introduced concepts of fundamental electricity and electrical circuits. It provides the basis for all the future compulsory and elective courses in the signal processing, control, energy and communication area, as well as those involving more advanced electric circuit design.

Pre-requisites and Assumed Knowledge

The minimum pre-requisite for the course is ELEC1111, while knowledge from MATH1231/MATH1241 will be assumed.

Following Courses

The concepts covered in this course are assumed knowledge for all following core courses ELEC2133, ELEC3104, ELEC3106, ELEC3115, ELEC3105, ELEC3114, ELEC3117, TELE3113.

Learning outcomes

After successful completion of this course, you should be able to:

1. Be able to apply transform methods to analyse continuous-time linear systems.
2. Demonstrate an understanding of how signals and linear systems interact.
3. Be able to analyse simple and complex electric and magnetic circuits.
4. Demonstrate an understanding of concepts related to AC power analysis.

This course is designed to provide the above learning outcomes which arise from targeted graduate capabilities listed in ***Appendix A***. The targeted graduate capabilities broadly support the UNSW and Faculty of Engineering graduate capabilities (listed in ***Appendix B***). This course also addresses the Engineers Australia (National Accreditation Body) Stage I competency standard as outlined in ***Appendix C***.

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 in the form of smaller modules by Dr Mohaddese Nosratighods, Dr Rukmi Dutta and other EE&T staff. In addition, tutorials and laboratories are carried out in “block-mode”, where students are required to attend in Weeks 3/4 and 7/8 only, where they will undertake all labs and tutorials in an intensive fashion.

The teaching in this course aims to establish a good fundamental understanding of the areas covered by using the lecture material, tutorials which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material, and laboratory sessions which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills. Small periodic quizzes are also provided, to enable students to assess their understanding of the concepts.

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

- 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 in the recording.

Laboratory
The laboratories provide the student with hands-on experience to design, analyse and test the electric circuits. Students will also learn how to use MATLAB and PSPICE for circuit analysis. Students must come prepared for laboratory sessions. During the laboratory, you may consult with others in the class, but you are encouraged to keep your own notes of the laboratory. In particular, note that laboratory assessment (checkpoints) will be conducted individually, not on a per-group basis. Laboratory reports are to be marked by the lab demonstrators. There are five reports to be marked, each of which worth 2%. Group reports are acceptable provided there are no more than 2 members in the group.

There will be five checkpoints to assess your theoretical and experimental skills throughout the labs which are worth 3% each. **Please also note that you must pass the laboratory component in order to pass the course.**

Tutorials
Students are required to attend tutorials in Week 3/4 and 7/8 as specified in the *Contact hours* on Page 6. **Tutorials are not in place as another form of lecture. It is important that you come to tutorials prepared and ready with questions to ask the tutor.** The tutorial sessions are meant to be interactive, allowing students to participate in the solving of problems.

Assessment
You are expected to view all lectures, and attend all tutorials, labs and quizzes, in order to maximize learning. **As the tutorial contact time is limited, it is important to prepare your tutorial questions in advance of attending the tutorial classes. You must prepare well for your laboratory classes, and will be tested on this preparation at the beginning of each lab exercise.** In addition to the lecture notes and video lectures, you should read relevant sections of the recommended text. Reading additional texts will further enhance your learning experience. Group learning is also encouraged.

Activity	**Assessment**	**Remarks**
Laboratory practical experiments	25%	Must pass laboratory component
Weekly quiz	10%	
Mid-session assessment	15%	Organized date TBA
Final written examination	50%	Organized date TBA Must pass final exam
TOTAL	**100%**	

Weekly Quizzes
Weekly quizzes worth 2% each will take place at the end of Weeks 1, 2, 5, 6 and 7. The aim

of weekly quizzes is to ensure that learning activities are conducted evenly through 8 weeks rather than in a bulk manner. The video lectures will be viewable only if a satisfactory grade (pass) is gained from the previous weekly quiz.

Mid-Session Assessment

There will be one quiz conducted probably in Week 5 which has a 15% weighting. This short examination will provide you with the feed back on your strengths and weaknesses which assists the learning process and thereby sustains a sense of motivation and interest.

Final Examination

The exam in this course is a standard closed-book 3 hours written examination, comprising five compulsory questions. University approved calculators are allowed.

The examination tests analytical and critical thinking and general understanding of the course material in a controlled fashion. Questions may be draw from any aspect of the course, unless specifically indicated otherwise by the lecture staff. **Please note that you must pass the final exam in order to pass the course**. **There are no supplementary exams for ELEC/TELE summer session courses.**

Note: For all class assessment tasks i.e. laboratory and quizzes, if a student is unable to attend for medical or other serious reasons (e.g. a death in the family) they must present medical certificates and/or other documentation within 3 days of the assessment to the lecturer in charge. If this is not done within the required time period then no consideration will be given.

Relationship of Assessment Methods to Learning Outcomes

	Learning Outcomes			
Assessment	1	2	3	4
Tutorial-Laboratory assessments	✓	✓	✓	✓
Mid-semester exam	✓	✓	✓	✓
Final exam	✓	✓	✓	✓

Course Schedule

INTRO LECTURE

Date	Time	Location
30-Nov-16	12pm-2pm	Chemical Sciences Mezzanine M11

LABS

Date	Time	Location
3-Jan-17	9am-11am	EE125
3-Jan-17	12pm-2pm	EE125
4-Jan-17	12pm-3pm	EE125
5-Jan-17	12pm-3pm	EE125
6-Jan-17	12pm-3pm	EE125
30-Jan-17	12pm-3pm	EE125
31-Jan-17	9am-11am	EE125
31-Jan-17	12pm-2pm	EE125
2-Feb-17	12pm-3pm	EE125

3-Feb-17	12pm-3pm	EE125

TUTORIALS

Date	Time	Location
14-Dec-16	4pm-6pm	Chemical Sciences Mezzanine M11
3-Jan-17	4pm-6pm	Chemical Sciences Mezzanine M11
4-Jan-17	4pm-6pm	The Red Centre Theatre
5-Jan-17	4pm-6pm	Chemical Sciences Mezzanine M11
24-Jan-17	4pm-6pm	Chemical Sciences Mezzanine M11
25-Jan-17	4pm-6pm	Chemical Sciences Mezzanine M11
30-Jan-17	4pm-6pm	Chemical Sciences Mezzanine M11
31-Jan-17	4pm-6pm	Chemical Sciences Mezzanine M11
2-Feb-17	4pm-6pm	Chemical Sciences Mezzanine M11

MID SESSION TEST

Date	Time	Location
TBA	TBA	TBA

FINAL EXAM

Date	Time	Location
TBA	TBA	TBA

Course Resources

Course web site

Moodle is used as the course web site: *http://moodle.telt.unsw.edu.au/*

You will need your student z-pass to log on. It is important that you check Moodle several times per week. It serves as the class notice board where all important messages about this particular course are posted. In addition, students can download lecture notes, lab notes, tutorial handouts and other course-related materials. Also, links to some useful web sites are provided.

As the course progresses, students' marks from assessments such as labs and the mid-session test are available for personal viewing on this website.

Recommended Text(s):
1. "Fundamentals of Electric Circuits" Alexander & Sadiku, McGraw Hill.

Further Text(s) and Reference(s):
The reference books provide further reading in electrical engineering as well as a detailed treatment of circuit theory and digital circuits.

1) Oppenheim and Willsky, *Signals and Systems*, Prentice-Hall.
2) R.C. Dorf and J.A. Svoboda, *Introduction to Electric Circuits*, Wiley.
3) Etter, D.M., *Engineering Problem Solving with MATLAB*, Prentice-Hall.
4) Goody, R. W., *MicroSim PSPICE for Windows-Volume 1*, Prentice-Hall.

MIT course website for Circuits and Electronics
http://ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/6-002Spring-2007/CourseHome/

Other Matters

Academic Honesty and Plagiarism

Plagiarism is the unacknowledged use of other people's work, including the copying of assignment works and laboratory results from other students. Plagiarism is considered a form of academic misconduct, and the University has very strict rules that include some severe penalties. For UNSW policies, penalties and information to help you avoid plagiarism, see http://www.lc.unsw.edu.au/plagiarism. To find out if you understand plagiarism correctly, try this short quiz: https://student.unsw.edu.au/plagiarism-quiz.

Student Responsibilities and Conduct

Students are expected to be familiar with and adhere to all UNSW policies (see https://my.unsw.edu.au/student/atoz/ABC.html), and particular attention is drawn to the following:

Workload

It is expected that you will spend at least **ten to twelve hours per week** studying a 6 UoC course, from Week 1 until the final assessment, including both face-to-face classes and *independent, self-directed study*. In periods where you need to need to complete assignments or prepare for examinations, the workload may be greater. Over-commitment has been a common source of failure for many students. You should take the required workload into account when planning how to balance study with employment and other activities.

Attendance

Regular and punctual attendance at all classes is expected. UNSW regulations state that if students attend less than 80% of scheduled classes they may be refused final assessment.

General Conduct and Behaviour

Consideration and respect for the needs of your fellow students and teaching staff is an expectation. Conduct which unduly disrupts or interferes with a class is not acceptable and students may be asked to leave the class.

Work Health and Safety

UNSW policy requires each person to work safely and responsibly, in order to avoid personal injury and to protect the safety of others.

Special Consideration and Supplementary Examinations

You must submit all assignments and attend all examinations scheduled for your course. You should seek assistance early if you suffer illness or misadventure which affects your course progress. All applications for special consideration must be **lodged online through myUNSW within 3 working days of the assessment**, not to course or school staff. For more detail, consult https://my.unsw.edu.au/student/atoz/SpecialConsideration.html.

Continual Course Improvement

This course is under constant revision in order to improve the learning outcomes for all students. Please forward any feedback (positive or negative) on the course to the course

convener or via the Course and Teaching Evaluation and Improvement Process. You can also provide feedback to ELSOC who will raise your concerns at student focus group meetings. As a result of previous feedback obtained for this course and in our efforts to provide a rich and meaningful learning experience, we have continued to evaluate and modify our delivery and assessment methods.

Administrative Matters

On issues and procedures regarding such matters as special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students, please refer to the School and UNSW policies:
http://www.engineering.unsw.edu.au/electrical-engineering/policies-and-procedures
https://my.unsw.edu.au/student/atoz/ABC.html

Appendix A: Targeted Graduate Capabilities

Electrical Engineering and Telecommunications programs are designed to address the following targeted capabilities which were developed by the school in conjunction with the requirements of professional and industry bodies:

- The ability to apply knowledge of basic science and fundamental technologies;
- The skills to communicate effectively, not only with engineers but also with the wider community;
- The capability to undertake challenging analysis and design problems and find optimal solutions;
- Expertise in decomposing a problem into its constituent parts, and in defining the scope of each part;
- A working knowledge of how to locate required information and use information resources to their maximum advantage;
- Proficiency in developing and implementing project plans, investigating alternative solutions, and critically evaluating differing strategies;
- An understanding of the social, cultural and global responsibilities of the professional engineer;
- The ability to work effectively as an individual or in a team;
- An understanding of professional and ethical responsibilities;
- The ability to engage in lifelong independent and reflective learning.

Appendix B: UNSW Graduate Capabilities

The course delivery methods and course content directly or indirectly addresses a number of core UNSW graduate capabilities, as follows:

- Developing scholars who have a deep understanding of their discipline, through lectures and solution of analytical problems in tutorials and assessed by assignments and written examinations.
- Developing rigorous analysis, critique, and reflection, and ability to apply knowledge and skills to solving problems. These will be achieved by the laboratory experiments and interactive checkpoint assessments and lab exams during the labs.
- Developing capable independent and collaborative enquiry, through a series of tutorials spanning the duration of the course.

- Developing digital and information literacy and lifelong learning skills through assignment work.
- Developing ethical practitioners who are collaborative and effective team workers, through group activities, seminars and tutorials.
- Developing independent, self-directed professionals who are enterprising, innovative, creative and responsive to change, through challenging design and project tasks.
- Developing citizens who can apply their discipline in other contexts, are culturally aware and environmentally responsible, through interdisciplinary tasks, seminars and group activities.

Appendix C: Engineers Australia (EA) Professional Engineer Competency Standard

	Program Intended Learning Outcomes	
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals	✓
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing	✓
	PE1.3 In-depth understanding of specialist bodies of knowledge	✓
	PE1.4 Discernment of knowledge development and research directions	
	PE1.5 Knowledge of engineering design practice	
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice	
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving	✓
	PE2.2 Fluent application of engineering techniques, tools and resources	✓
	PE2.3 Application of systematic engineering synthesis and design processes	
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability	
	PE3.2 Effective oral and written communication (professional and lay domains)	✓
	PE3.3 Creative, innovative and pro-active demeanour	
	PE3.4 Professional use and management of information	
	PE3.5 Orderly management of self, and professional conduct	
	PE3.6 Effective team membership and team leadership	