School of Electrical Engineering and Telecommunications

Semester 2, 2018
Course Outline

ELEC1111
Electrical and Telecommunications Engineering

COURSE STAFF

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Consultations: You are encouraged to ask questions on the course material, after the lecture class times in the first instance, rather than via email. Lecturer consultation times will be advised on Moodle (https://moodle.telt.unsw.edu.au/login/index.php), which is the online learning and teaching management platform used in this course. You can also post questions on Moodle discussion forums (highly encouraged). You may also be interested in using other online platforms outside Moodle to communicate with fellow students who currently take the course or have taken it before, such as Discord. You are welcome to email the tutor or laboratory demonstrator, who can answer your questions on this course and can also provide you with consultation times. ALL email enquiries should be made from your student email address with "**ELEC1111**" in the subject line; otherwise they may not be answered.

Keeping Informed: All announcements regarding the course and its assignments will be made via Moodle. Announcements may also be made during classes but everything will be formally posted on the "Course Announcements" forum of ELEC1111 in Moodle. 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 course consists of:

- Lecture: 3 hours every week (2 sessions), starting from Week 1.
- Tutorials:
  - Face-to-face regular tutorials: 1 hour every week, starting from Week 2.
  - Face-to-face drop-in flipped tutorials: 2 hours every three weeks, starting from Week 3.
  - Online tutorials: 1 hour every week, starting from Week 2.
- Laboratory Experiments: 2 hours every week, starting from Week 3.

Session	Day	Time	Location
Lectures	Monday	12pm - 12pm	CLB 7 Click here for the map
	Thursday	12pm - 1pm	Sir John Clancy Auditorium Click here for the map
Tutorials	Tuesday to Friday	Check Your Timetable	Check Your Timetable
Laboratories	Monday to Friday	Check Your Timetable	Labs G14/214, EE Building (G17), Click here for the map

Context and Aims

The theory of Electric Circuits is fundamental for the understanding and building of further knowledge in Electrical Engineering. ELEC1111 is an introductory course in Electrical Engineering, which provides an introduction to electrical circuits and fundamental electrical elements as well as the technical skills to analyse such circuits. This is a course suitable for students pursuing further studies in Electrical Engineering such as Power and Energy, Telecommunications, Control, Instrumentation, etc., as well as other related Engineering disciplines including Computer Science and Engineering. In the practical section, this course provides hands-on experience in building and testing circuits. This course is presented in such a way that students who have taken it are capable of building and analysing some practical, useful devices afterwards.

The aims of the course are to:

- Provide students with analytical and practical design experience.
- Ensure that students' design skills are adequate and to the level desirable for a professional engineer.
- Give students the opportunity to improve the design and engineering practice skills required by professional engineers.

Indicative Lecture Schedule

Period	Summary of Lecture Program
Week 1	Introduction, Circuit Basics Overview, Nodes & Meshes, Power & Energy
Week 2	Ohm's Laws, Kirchhoff's laws, Series & Parallel Connection of Elements
Week 3	Nodal and Mesh Analysis
Week 4	Circuit Theorems (Superposition, Thevenin, Norton, Source Transformation)
Week 5	Capacitors and Resistor-Capacitor (RC) Circuits
Break	
Week 6	Inductors and Resistor-Inductor (RL) Circuits
Week 7	Operational Amplifiers (Op Amps), **Mid-semester exam**
Week 8	AC Analysis I - Phasor and Impedance
Week 9	AC Analysis II - Circuit Theorems
Week 10	AC Power and AC Op Amps
Week 11	Digital Logic Circuits
Week 12	Revision

Indicative Laboratory Schedule

Period	Summary of Laboratory Program
Week 3	Lab/Experiment 1: Familiarization with Laboratory Equipment
Week 4	Lab/Experiment 2: Series and Parallel Circuits
Week 5	Lab/Experiment 3: Circuit Construction and Kirchhoff's Laws
Break	
Week 6	Lab/Experiment 4: Network Theorems
Week 7	Lab/Experiment 5: RC & RL Transients
Week 8	Lab/Experiment 6: Operational Amplifiers (Op Amps)
Week 9	Lab/Experiment 7: AC Circuits and AC Power
Week 10	Open Laboratories
Week 11	**Lab Exam**
Week 12	**Lab Exam**
Week 13	Lab/Experiment 8: Digital Logic Circuits

Assessment

The following summative assessment tasks will give you your final mark for Semester 2, 2018.

1. Mid-Semester Exam (1 hour)	25%
2. Laboratory Assessment and Exam	20%
3. Online Quizzes	5%
4. Final Exam (2 hours)	50 %
Total:	100%

- The **mid-semester exam** is scheduled in **Week 7** of the semester.
- The **laboratory exam** will take place in **Weeks 11** and **12** of the semester.
- The date of the **final exam** will be announced by the University.

For further details on each assessment task and their marks please refer to the Assessment section of this document.

COURSE DETAILS

Credits

ELEC1111 is 6 UOC course. The expected average workload is approximately **16 hours per week** throughout the semester, including face-to-face contact hours and self-studying.

Relationship to Other Courses

This course is an introduction to electrical engineering for both Electrical and Telecommunications Engineering students and other engineering disciplines in general across the faculty. It is a pre-requisite for many other courses both in electrical and other engineering schools.

Pre-requisites and Assumed Knowledge

There are no particular pre-requites for this subject, but it is essential to have physics and mathematics background at high-school level.

Following Courses

This course is a pre-requisite for Circuits and Signals course (ELEC2134).

Learning outcomes

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

LO1. Systematically analyse AC and DC electric circuits by deriving and solving equations using Kirchhoff's laws and circuit theorems.
LO2. Obtain the transient and steady state behaviour of a first order circuit.
LO3. Demonstrate a basic understanding of phasors and phasor diagrams for AC circuit analysis.
LO4. Apply sinusoidal steady state analysis to AC circuits and distinguish between AC power definitions.
LO5. Apply concepts of circuit analysis in circuits with ideal operational amplifiers.
LO6. Demonstrate basic proficiency in building basic electric circuits, operate fundamental electrical engineering equipment, work in a laboratory environment and follow occupational health and safely (OH&S) regulations.
LO7. Perform basic simulations of DC and AC circuits using appropriate software.

The course delivery methods and course content address several core UNSW graduate attributes. These include:

- The capacity for analytical and critical thinking and for creative problem solving.
- The ability to engage in independent and reflective learning.
- Information Literacy – the skills to locate, evaluate, and use relevant information.
- The capacity for enterprise, initiative, and creativity.
- The skills of effective communication.

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 in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures.
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and provide the student with practical construction, measurement and debugging skills.

Learning in this course

You are expected to attend all lectures, tutorials, labs, and mid-semester exam to maximise learning. You should attempt all your problem sheet questions in advance of attending the tutorial classes. The importance of adequate preparation prior to each tutorial cannot be overemphasized, as the effectiveness and usefulness of the tutorial depends to a large extent on this preparation. You must also prepare well for your laboratory classes, as you will be tested for this preparation at the beginning of each lab session. In addition to the lecture notes/videos, you should read relevant sections of the recommended text. Reading additional texts will further enhance your learning experience. UNSW *assumes* that self-directed study of this kind is undertaken in addition to attending face-to-face classes throughout the course. *Group learning/study and collaboration throughout the course is strongly encouraged.*

Lectures

Recorded video lectures will be made available to students to support the scheduled face-to-face lectures. Students should note that watching recordings is no substitute for attending the classes, where live questions can be asked. Note that having access to recorded lectures does not imply improved exam preparation, without significant and consistent additional self-directed study through the semester.

Tutorials

Three modes of tutorials will be provided in ELEC1111.

1. *Face-to-face regular tutorials*: These are one-hour regular tutorial sessions where answers to tutorial questions are discussed. The tutor covers the more complex questions. In addition, questions may be provided by the tutor for you to try in class. Group learning is encouraged.
2. *Face-to-face drop-in flipped tutorials*: These two-hour drop-in sessions function in a collaborative manner. Students are encouraged to work in groups of 2 to 3 and try to solve the given problems by applying their learnings from the lectures and regular tutorials. The tutors will mentor the students to solve the questions correctly, and if it seems necessary, they would help by explaining the problem-solving techniques for the more challenging questions.
3. *Online tutorial videos*: These are pre-recorded solutions of typical tutorial questions, that you can watch at your own time and pace. It is strongly encouraged that you attempt to solve the questions of these tutorials before watching the videos to observe the methods and theory used in each question. The format of the videos is typically 3 - 5 minutes long, which is a lot more concentrated than a normal tutorial class. It is expected that you spend at least one hour per week on solving and watching these tutorials.

Laboratory sessions

The laboratory schedule is deliberately designed to provide practical, hands-on exposure to the concepts conveyed in lectures soon after they are covered in class. Students are required to attend the laboratories as outlined in the Contact Hours. The laboratories are an integral part of learning in this course as they allow you to build circuits, measure and observe in real life the theory of the lectures. You are expected to attend all labs, and lab exam. You must prepare well for your laboratory classes as your lab work will be assessed during each lab session. In addition to the lab work, you may have feedback sessions with your lecturer for a face-to-face discussion in open laboratory sessions.

NOTE: *There is no laboratory exemption for this course*. Regardless of whether equivalent labs have been completed in previous semesters, all students enrolled in this course must take the labs. If, for medical reasons, (note that a valid medical certificate must be provided) you are unable to attend a lab, you will need to apply for a catch-up lab during another lab time, as agreed by the laboratory coordinator.

ASSESSMENT

The assessment scheme in this course reflects the intention to assess your learning progress throughout the semester. Ongoing assessment occurs through the mid-semester exam, lab experiments (see lab manual), online tutorial quizzes and lab exams[1].

Mid-Semester Exam

There will be a one-hour exam scheduled in **Week 7**, which tests your general understanding of the course material. It is designed to give you feedback on your progress through the analytical components of the course. Questions may be drawn from any course material up to the end of week 6. Marks will be assigned according to the correctness of the responses. This exam accounts for **25%** of the total course mark (see page 3).

Laboratory Assessment

Laboratories are primarily about learning, and the laboratory assessment is designed to check your knowledge as you progress through each stage of the laboratory tasks. The laboratory manual, which contains the instructions on the laboratory experiments and equipment, will be provided in a PDF file on Moodle. A printed version can be purchased from UNSW Bookshop (Click here for the map). You are required to **record your observations** in the laboratory manual to receive your lab mark. Several **online training videos** have been created to help you to familiarise with the laboratory equipment and how to use it properly. These videos are available on Moodle as well as on the PDF version of the laboratory manual via provided hyperlinks.

NOTE: Students must **upload the completed occupational health and safely (OH&S) form** to the submission page provided on Moodle before attending the first practical laboratory session. If a student attends laboratory sessions without having submitted a signed OH&S form, the lab demonstrators will NOT assess the student's lab work until the form is submitted.

The laboratory assessment comprises of two parts:

1. *Pre-lab exercises*, which accounts for 20% of your lab assessment mark. These are questions that must be completed and answered before you attend each of the lab sessions. Students without a completed pre-lab exercise will NOT be allowed to participate in the experiment.
2. *Lab experiments*, which accounts for 80% of your lab assessment mark. This includes your measurements, graphs, and answers to lab questions completed in your laboratory manual. The experimental part **must** be completed within the allocated 2 hours of each lab session. It will be marked throughout the experiment by your lab demonstrators on your lab manual.

The laboratory assessment accounts for **10%** of your total course mark out of the 20% allocated mark (see page 3).

Laboratory Exam

To check whether you have achieved the practical learning outcomes for the course, you will be examined in the laboratory. In **Weeks 11** and **12**, after the first 7 lab experiments have been completed, a practical exam will take place. Laboratory exams are closed-book practical exams that include an experiment with its relevant analytical calculations. The exam will be based on what you have learned in your laboratory classes and the applied theory from lectures. Marks will be awarded for the correct understanding of practical and relevant theoretical concepts, correct operation of laboratory equipment, and correct interpretation of measured results. The lab exam accounts for **10%** of your total course mark out of the 20% allocated mark (see page 3).

NOTE: You **MUST** attend at least **7 out of the 8** lab experiments **AND** pass the laboratory assessment **AND** pass the lab exam to pass the course. A satisfactory performance in both lab assessments and lab exam is a necessary requirement to pass this course. This means that even if you score 100% on the final written examination and on the quizzes, **you will not pass the course** if your overall mark for lab assessments and lab exam is not satisfactory.

Online Quizzes

Each week starting from Week 2, there will be one an online quiz related to the materials covered in the previous week of the course. Once a quiz is made available online, you can complete the quiz at your own convenience,

[1] For all face-to-face assessment tasks, i.e., laboratories and mid-semester exams, if the student is unable to attend for medical or other serious reasons, the student must present medical certificates and/or other documentation within 3 days of the assessment. If this is not done within the required period then no consideration will be given. In the case of missing an exam/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 percentage of the total course mark.

but the **deadline for each quiz is one week** from the opening date. The length of each quiz may vary from 20 minutes to 40 minutes depending of the difficulty level. You can have unlimited attempts for each quiz before it is closed. You **highest mark** from your attempt will be your final mark for each quiz. The average mark of the 11 quizzes accounts for the total mark of this assignment. The overall mark for this assignment accounts for **5%** of your total course mark.

Final Exam

The exam in this course is a standard closed-book 2-hour written examination. 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 drawn from any aspect of the course that has been presented in lectures, tutorials and/or laboratories, unless specifically indicated otherwise by the lecturer. Marks will be assigned according to the correctness of the responses. The final exam mark accounts for **50%** of the total course mark (see page 3).

NOTE: You **MUST** achieve a minimum of **40 marks out of 100** in the final exam to pass the course.

Relationship of Assessment Methods to Learning Outcomes

	Learning outcomes						
Assessment	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**LO6**	**LO7**
Mid-semester exam	✓	✓	✓	✓	-	-	-
Laboratory assessment	✓	-	-	-	-	✓	✓
Laboratory exam	✓	-	-	-	-	✓	-
Online quizzes	✓	✓	✓	✓	-	-	-
Final exam	✓	✓	✓	✓	-	-	-

COURSE RESOURCES

Textbooks

Prescribed textbook

- C. K. Alexander and M. N. O. Sadiku, *Fundamentals of Electric Circuits*, 6th ed., New York, NY, USA: McGraw-Hill, 2017.

Available at UNSW Bookshop, UNSW Library, McGraw-Hill website, or online retailers.

Other reference books

- R. C. Dorf and J. A. Svoboda, *Introduction to Electric Circuits*, 9th ed., Hoboken, NJ: John Wiley and Sons, 2013.
- J. D. Irwin and R. M. Nelms, *Basic Engineering Circuit Analysis*, 11th ed., Hoboken, NJ: John Wiley and Sons, 2015.

On-line resources

Moodle

As a part of the teaching component, the online teaching and learning management system known as Moodle will be used to disseminate teaching materials, host forums and quizzes. As the course progresses, students' marks from assessments such as labs and the quizzes will also be made available via Moodle: https://moodle.telt.unsw.edu.au/login/index.php.

Simulation

Although simulation of electric circuits is not an assessable part of the ELEC1111 course, students are **strongly encouraged to familiarise** themselves with building basic simulations and also measuring and interpreting results of simulations. Throughout the semester, some of the examples will be provided as simulation files.

There are several simulation programs that can be used not only for this course, but also for the rest of your Electrical Engineering degree. One online simulation platform is a browser-based applet for simulation of electric circuits available at http://www.falstad.com/circuit. It is a simple-to-use and easy-to-understand online application that allows you to simulate simple electric circuits. It is also very simple to share cases and simulations with others.

For those of you looking for a more sophisticated software to perform simulations, you can refer to MATLAB and Simulink: https://au.mathworks.com, LabVIEW: https://www.ni.com/en-au/shop/labview.html, OrCAD PSpice Designer: http://www.orcad.com/products/orcad-pspice-designer/overview, and Quite Universal Circuit Simulator: http://qucs.sourceforge.net. PSpice, MATLAB, and LabVIEW are most commonly used programming software in Electrical Engineering, which are worth learning at early stages in your degree.

OTHER MATTERS

Dates to note

Important Dates available at: https://student.unsw.edu.au/dates

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 https://student.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://student.unsw.edu.au/guide), 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://student.unsw.edu.au/special-consideration.

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 online student survey myExperience. 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:
https://student.unsw.edu.au/guide
https://www.engineering.unsw.edu.au/electrical-engineering/resources

APPENDICES

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 address 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	