# ELEC1111
# Electrical and Telecommunications Engineering

## Course Outline – Semester 2, 2015

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

## Course Staff


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**Consultations**
One of the main reasons for running the tutorials is that they provide opportunities for students to ask questions and get direct assistance. So first try to get help from your tutors during the tutorial periods. If this is still not satisfactory then students should feel free to contact the lecturer, either by e-mail or face-to-face consultation (consultation times will be posted on Moodle). Note: unless your tutorial attendance record is good, your request for consultation with the lecturer will not be granted.

## Course Details

## Credits (UOC)
Course ELEC1111 is 6 UOC with an expected average workload of approximately 10-12 hours per week during session.

## Contact hours
The course consists of:

- 3 hours of lectures (2 + 1 hrs)
- 1 hour of tutorial (starting in Week 2)
- 2 hours of laboratory every week (starting in Week 2)

Please consult the timetable for the current timetable:

http://www.timetable.unsw.edu.au/current/ELEC1111.html

## Course Information

## Context and aims
ELEC1111 is an introductory course in Electrical Engineering. It gives an overview of the fundamental aspects of electrical and telecommunications engineering. The course provides basic technical skills to analyse simple circuits and understand the principle of operation of electrical machines and systems. In the practical section it provides hands-on experience in building and testing circuits. It is packaged in such a way that students, having taken this course, can go away and build some practical, useful devices afterwards.

## Course Objectives

At the end of the course you should be able to:

1. Have an overview of what can be achieved with electrical engineering.
2. Understand elementary concepts of electrical and electronic circuits, and their analysis.
3. Be familiar with basic laboratory equipment and techniques to measure electrical quantities.

## Prerequisites and assumed knowledge

There are no prerequisites for this course but it would be helpful to have a physics and mathematics background at high school level, in particular, working knowledge of basic mathematics including differentiation and integration techniques.

## Learning outcomes

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

1. Use Kirchhoff's laws, circuit theorems and node voltage methodology to solve simple DC as well as AC circuits.
2. Solve simple 1st order transient circuits.
3. Apply simple steady state sinusoidal analysis to circuits.
4. Demonstrate a basic understanding of phasors and phasor diagrams for AC circuit analysis.
5. Reflect a basic understanding of transformer operation, through analysis of transformer circuits.
6. Analyse ideal operational amplifier application circuits and digital circuits.
7. Demonstrate basic proficiency in building basic electrical circuits and operating fundamental electrical engineering equipment.

## Contribution of course to graduate attributes

- Development of knowledge and a basic understanding in the main areas of electrical and electronics.
- Development of analytical and critical thinking (via laboratory work and creative problem solving).
- The ability to engage in independent and reflective learning, which is addressed by the laboratory exercises.

## Teaching strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered by using

- Formal lectures
- 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.
- Video lectures will be posted in the Moodle website. Note these the video lectures are NOT intended as a replacement of the face-to-face lectures. It is possible that some

material will be provided by video lecture only later in session. They are of great benefit for students to review lecture material at their own pace, particularly for examination preparation.

- Midsession test, to enable students to assess their understanding of the concepts.

## Draft Lecture schedule:

| Week No | Summary of Lecture Program |
|---|---|
| 1 | Introduction, Circuit Basics & Lab Safety |
| 2 | Kirchhoff's laws, Series & Parallel circuits, Power & Energy |
| 3 | Nodal & Mesh analysis |
| 4 | Network Theorems |
| 5 | Inductors & capacitors |
| 6 | First order circuits – RL & RC circuits, |
| 7 | Transient responses, **Midsession test** |
| 8 | Intro to sinusoids |
| 9 | AC systems |
| 10 | Operational amplifiers |
| 11 | Digital logic circuits |
| 12 | Transformers |

## Tutorials

Start in week 2. Refer to myUNSW web site (http://my.unsw.edu.au) for times and locations.

- Students are required to attend a one-hour tutorial every week.
- Tutorial groups are determined at enrolment.
- You can check your personalized timetable on the myUNSW web site.
- Note that no marks are awarded directly for any part of the tutorial program in this course. However, they should still be treated as an important aspect of the course, not to be taken lightly.

There are two components of the tutorial program:

1. Sets of problems are provided to give the student personal practice in solution and understanding. These problems will be related to recent lecture material with an emphasis on the basic concepts.
2. Demonstrations of important problem solving techniques by tutors.

## Laboratories

Start in week 2.

**Students must watch online the Safety Video Lecture in Week 1 and sign the Occupational Health and Safety Declaration form before being allowed to undertake the labs from Week 2. The Safety Lecture and Occupational Health and Safety Declaration form can be obtained via Moodle. The declaration form must be handed to the lab demonstrators on the day of your first lab.**

**Laboratory Purchase**
The following items will be required in the laboratory:

- Soldering and components kit - $10.
- Safety goggles - $5 (or bring your own)
- Prototyping board - $15 (useful if you are continuing with EE&T)

Pay money at School Office in Elec. Eng. Building (room EEG1) or in Electronic Workshop (room EEG14A) for soldering and components kit. Once a receipt is issued, pick up the items from the Electronic Workshop (room EEG14A)

For students continuing in Electrical Engineering & Telecommunications, it is also recommended to purchase a **small pair of wire strippers** for cutting and trimming component wires, and a **small pair of long-nose pliers** for inserting components into a prototyping board. These two items may be purchased from most electronics or hardware stores and will be used extensively in this and future laboratory courses.

## Laboratory Schedule

| Week | Topics |
|---|---|
| 1 | Watch online the Safety Video Lecture and sign the OHS form (link in Moodle) |
| 2 | Familiarization with laboratory equipment |
| 3 | Soldering and circuit construction & simple measurements. |
| 4 | Kirchhoff's laws |
| 5 | Series and parallel circuits |
| 6 | Network theorems |
| 7 | RC transients |
| 8 & 9 | Laboratory test |
| 10 | Operational amplifiers |
| 11 | Digital logic circuits |
| 12 | Power & Energy |
| 13 | Make up labs |

## Assessment

You are expected to attend all lectures, tutorials, labs and midsession test, in order to maximize learning. It is a UNSW requirement that you attend at least 80% of your classes. You should 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. In addition to the lecture notes, you should read relevant sections of the recommended text. Reading additional texts would further enhance your learning experience. Group learning is also encouraged.

| Activity | Weightage | Remarks |
|---|---|---|
| Laboratory experiments | 15% | - |
| Laboratory practical test | 5% | - |
| Midsession test (week 7) | 20% | - |

| | | |
|---|---|---|
| Final written exam | 60% | Must pass to pass the course |
| **Total** | **100%** | **-** |

## 1) Laboratory assessment

- You are required to maintain a lab book for recording your observations. A lab book is an A4 size notebook containing a mix of plain pages and graph sheets. You have to purchase you own lab book from any stores.
- It is essential that you complete the laboratory preparation before coming to the lab. You will be recording your observations/readings in your lab book first and then complete and submit the results sheet before leaving the lab.
- The results sheet will be assessed by the laboratory demonstrator.
- A practical test will be run during the laboratory period in weeks 8 & 9.
- Students must complete the safety form posted online before starting the laboratory component. If a student attends laboratory sessions without having completed the safety declaration the marks for those labs will be zero.
- Students who are **unable to attend a lab session:** make up labs will be organized in the last week (week 13) of the semester (after all 9 labs completed)

**NOTE: There will be no lab exemptions in this course for repeat students.**

## 2) Midsession assessment

- There will be a midsession assessment in week 7. The test could be either online or a written test similar to final exam. The exact details about the assessment will be announced by week 4.
- Repeat students are NOT exempt from this assessment.
- Note: For all class assessment tasks, i.e. laboratory test and midsession test, if the student is unable to attend for **medical or other serious reasons** (i.e., a death in the immediate family) the student must **present medical certificates and/or other documentation to the lecturer within 1 week of the assessment task**. If this is not done within the required time period then no consideration will be given. In case of missing the midsession test or the lab test for one of the reasons above, the assessment will be carried over to the final exam; i.e., the final exam percentage will be increased by the percentage of the assessment. For example, the final exam will be assessed for 80% instead of 60%, in case of missing the midsession test.

## 3) Final Exam

- The final exam will be a closed book exam for 3 hours. In principle, the examination may cover any aspect of the course that has been presented in lectures, tutorials and/or laboratories. You must pass the final exam to pass the course.
- **If required, a *supplementary examination* for any student granted one by the School for major and documented medical reasons will be held shortly after the course results are released. Check with EE&T school office for dates. These**

**dates are NOT flexible and students will need to ensure that they are available at this time if required.**

### Relationship of Assessment Methods to Learning Outcomes

| | Learning outcomes | | | | | | |
|---|---|---|---|---|---|---|---|
| **Assessment** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| Laboratory practical assessments | ✓ | ✓ | ✓ | - | ✓ | ✓ | ✓ |
| Lab exam | ✓ | - | - | - | - | - | ✓ |
| Mid-semester exam | ✓ | ✓ | - | - | - | - | - |
| Final exam | ✓ | ✓ | ✓ | ✓ | ✓ | - | - |

## Course Resources

### Course web site

- All announcements and course materials will be hosted on the UNSW Moodle at: https://moodle.telt.unsw.edu.au/login/index.php
- You should be automatically enrolled in ELEC1111 on Moodle. You will need your zPass to access this.
- All marks from can be found on Moodle.
- A discussion forum is available in Moodle where students can post their doubts and discussions. Any student can answer the questions by any other student. Only questions related to ELEC1111 can be posted.

## Recommended texts

- "Electrical Engineering Principles and Applications", Allan R Hambley, Prentice Hall.
- "Fundamentals of Electric Circuits" Alexander & Sadiku, McGraw Hill. (This is also the text for 2nd yr EE.)

## Further texts and references

The reference books provide further reading in electrical engineering as well as a detailed treatment of circuit theory and digital circuits.

1. L.S. Bobrow, Elementary Linear Circuit Analysis, Oxford, 1987 [P621.3192/106]. This was the previous text for this course and also for ELEC2031.
2. J.F. Wakerly, Digital Design: Principles and Practices, 3rd Edition, Prentice-Hall, 2000 [P621.395/100]. The previous edition was the text for this course and also for ELEC1041.
3. A.S. Sedra and K.C. Smith, Microelectronic Circuits, 4th Edition, Oxford, 1998 [P621.3815/292]. This book is the text for ELEC3006 but is useful because small signal analysis of micro-electronic circuits is a major source of application of linear circuit theory.

4. R.L. Boylestad, Introductory Circuit Analysis, 9th Edition, Prentice-Hall, 2000 [PQ621.3815/198].
5. K.J. Breeding, Digital Design Fundamentals, 2nd Edition, Prentice-Hall, 1992 [P621.3815/214].
6. J.R. Cogdell, Foundations of Electrical Engineering, 2nd Edition, Prentice Hall, 1990 [P621.3/198].
7. J. Millman and A. Grabel, Microelectronics, McGraw-Hill, 1987 [P621.38173/68].

## 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 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.

## 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.
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## 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

## Use of EE&T Laboratory Regulations and Safety

Laboratory regulations and safety (PDF)
Occupational health and safety
First aid

### Student Responsibilities and Conduct

Students are expected to be familiar with and adhere to all UNSW policies (see https://student.unsw.edu.au/guide),

# 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.

# 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 | ✓ |