UNSW Course Outline

# ZEIT1206 Electrical Circuits - 2024

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## General Course Information

**Course Code :** ZEIT1206
**Year :** 2024
**Term :** Semester 2
**Teaching Period :** Z2
**Is a multi-term course? :** No
**Faculty :** UNSW Canberra
**Academic Unit :** School of Engineering and Technology
**Delivery Mode :** In Person
**Delivery Format :** Standard
**Delivery Location :** UNSW Canberra at ADFA
**Campus :** UNSW Canberra
**Study Level :** Undergraduate
**Units of Credit :** 6

**Useful Links**

Handbook Class Timetable

## Course Details & Outcomes

### Course Description

The focus of this course is on developing principles and tools for the analysis of electrical circuits, ranging in scale from electronic circuits to electrical power systems. This will be reinforced through circuit simulation (SPICE), and breadboard-based circuit implementation and measurement. The course builds upon practical skills and circuit analysis techniques learned in

Introduction to Electrical Engineering, and develops sophisticated analytical techniques using skills being developed in Mathematics 1A and 1B. This course will cover circuit analysis techniques (nodal analysis, mesh analysis, equivalent circuits), operational amplifiers, inductance and capacitance, transient analysis of first-order and second-order circuits, sinusoidal steady-state circuit analysis with phasors, transformers, power in sinusoidal steady-state circuits, and balanced three-phase circuits.

## Relationship to Other Courses

Prerequisite ZEIT1208 and ZPEM1303

# Course Learning Outcomes

| Course Learning Outcomes | Engineers Australia - Professional Engineer (Stage 1) |
|---|---|
| CLO1 : Apply circuit analysis techniques to DC circuits, including the node-voltage method, the mesh-current method, source transformations, and Thevenin/Norton equivalent circuits. | • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline<br>• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline<br>• PEE2.1 : Application of established engineering methods to complex engineering problem solving<br>• PEE2.2 : Fluent application of engineering techniques, tools and resources |
| CLO2 : Analyse and design circuits with ideal operational amplifiers. | • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline<br>• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline<br>• PEE2.1 : Application of established engineering methods to complex engineering problem solving<br>• PEE2.2 : Fluent application of engineering techniques, tools and resources |
| CLO3 : Perform transient analysis of first-order and second-order circuits including inductors and/or capacitors. | • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline<br>• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline<br>• PEE2.1 : Application of established engineering methods to complex engineering problem solving<br>• PEE2.2 : Fluent application of engineering techniques, tools and resources |
| CLO4 : Analyse circuits with sinusoidal sources using impedances and phasor techniques, and apply circuit analysis techniques to AC circuits, including balanced three-phase circuits. | • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline<br>• PEE1.2 : Conceptual understanding of the |

| | |
|---|---|
| | mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline<br>• PEE2.1 : Application of established engineering methods to complex engineering problem solving<br>• PEE2.2 : Fluent application of engineering techniques, tools and resources |
| CLO5 : Calculate the real power, reactive power, and complex power delivered or absorbed in AC circuits. | • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline<br>• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline<br>• PEE2.1 : Application of established engineering methods to complex engineering problem solving<br>• PEE2.2 : Fluent application of engineering techniques, tools and resources |
| CLO6 : Assemble and measure DC and AC circuits, compare measurements with theory and SPICE simulation, interpret these results, and document the findings in a coherent and literate manner. | • PEE2.1 : Application of established engineering methods to complex engineering problem solving<br>• PEE2.2 : Fluent application of engineering techniques, tools and resources<br>• PEE2.3 : Application of systematic engineering synthesis and design processes<br>• PEE3.2 : Effective oral and written communication in professional and lay domains<br>• PEE3.5 : Orderly management of self, and professional conduct<br>• PEE3.6 : Effective team membership and team leadership |

| Course Learning Outcomes | Assessment Item |
|---|---|
| CLO1 : Apply circuit analysis techniques to DC circuits, including the node-voltage method, the mesh-current method, source transformations, and Thevenin/Norton equivalent circuits. | |
| CLO2 : Analyse and design circuits with ideal operational amplifiers. | |
| CLO3 : Perform transient analysis of first-order and second-order circuits including inductors and/or capacitors. | |
| CLO4 : Analyse circuits with sinusoidal sources using impedances and phasor techniques, and apply circuit analysis techniques to AC circuits, including balanced three-phase circuits. | |
| CLO5 : Calculate the real power, reactive power, and complex power delivered or absorbed in AC circuits. | |
| CLO6 : Assemble and measure DC and AC circuits, compare measurements with theory and SPICE simulation, interpret these results, and document the findings in a coherent and literate manner. | |

# Learning and Teaching Technologies

Moodle - Learning Management System

# Learning and Teaching in this course

**The Learning Management System**

Moodle is the Learning Management System used at UNSW Canberra. All courses have a Moodle site which will become available to students at least one week before the start of semester. Please find all help and documentation (including Blackboard Collaborate) at the Moodle Support page.

UNSW Moodle supports the following web browsers:

» Google Chrome 50+
» Safari 10+
** Internet Explorer is not recommended

** Addons and Toolbars can affect any browser's performance.

Operating systems recommended are:

Windows 7, 10, Mac OSX Sierra, iPad IOS10

For further details about system requirements click here.

Log in to Moodle here.

If you need further assistance with Moodle:

For enrolment and login issues please contact:
IT Service Centre
Email: itservicecentre@unsw.edu.au
Phone: (02) 9385-1333
International: +61 2 9385 1333

For all other Moodle issues please contact:
External TELT Support
Email: externalteltsupport@unsw.edu.au
Phone: (02) 9385-3331
International: +61 2 938 53331

Opening hours:
Monday – Friday 7:30am – 9:30 pm
Saturday & Sunday 8:30 am – 4:30pm

# Additional Course Information

**Academic Integrity and Plagiarism**

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. All students are expected to adhere to UNSW's Student Code of Conduct https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Plagiarism undermines academic integrity and is not tolerated at UNSW. *It is defined as using the words or ideas of others and passing them off as your own, and* can take many forms, from deliberate cheating to accidental copying from a source without acknowledgement.

For more information, please refer to the following:

https://student.unsw.edu.au/plagiarism

**Referencing**

In this course, students are required to reference following the APA 7 / Chicago NB referencing

style. Information about referencing styles is available at: https://guides.lib.unsw.adfa.edu.au/c.php?g=472948&p=3246720

**Study at UNSW Canberra**

https://www.unsw.adfa.edu.au/study

Study at UNSW Canberra has lots of useful information regarding:

- Where to get help
- Administrative matters
- Getting your passwords set up
- How to log on to Moodle
- Accessing the Library and other areas.

**Additional Information as required**

CRICOS Provider no. 00098G
The University of New South Wales Canberra.

# Assessments

## Assessment Structure

| Assessment Item | Weight | Relevant Dates |
|---|---|---|
| Pre-Labs / Post-Labs | 10% | |
| Final Lab report<br>Short Extension: Yes (2 days) | 20% | |
| Class Test 2 | 10% | |
| Class Test 1 | 10% | |
| Exam | 50% | |

## Assessment Details

### Pre-Labs / Post-Labs

**Assessment Overview**

For each weekly laboratory exercise, students need to complete the Pre-Lab and Post-Lab. Both Pre-Lab and Post-Lab must be submitted through the Moodle, and will be graded as S (satisfactory) or U (unsatisfactory). Full satisfactory Pre-Labs and Post-Labs earn 10% of the course marks. Unsatisfactory or no submissions will reduce the marks on a pro rata basis. The Pre-Lab is mostly on-line quiz type assignments where the solutions are provided to

students immediately after the completion. The Pre-Lab preparation is essential for students to complete the lab exercises in the time available. After each lab session, students write up one-page summary report of their results and discussions as Post-Lab reports. The written feedback to the reports will be provided.

### Final Lab report

**Assessment Overview**

Students will be required to submit a Final Lab Report for Lab 4 DC power supply. The report is required to be submitted electronically via the DEC1 course's Moodle site. The report will have a strict page limit and formatting requirements, encouraging students to be precise and concise. The report must include reflections on the lab topic activities and the outcomes achieved, and how these activities link to what students have learnt from the lectures, tutorials and other lab activities.

### Class Test 2

**Assessment Overview**

The class test 2 will be held in week 10 to examine the students' understanding of the contents covered in the lectures and tutorials by week 10. The test will be closed book.

### Class Test 1

**Assessment Overview**

The class test 1 will be held in week 5 to examine the students' understanding of the contents covered in the lectures and tutorials by week 5. The test will be closed book.

**Detailed Assessment Description**

The class test 1 will be held in week 4.

### Exam

**Assessment Overview**

Exam is held during the exam period, which covers all topics in the course. The exam will be closed book.

## General Assessment Information

Pre-/post-lab: 10% [Individual]: this includes 8 pre-lab activities due before Thursdays and 3 post-

lab activities due Friday after lab sessions

Final lab report: 20% [Individual]

Class test 1: 10% [Individual]

Class test 2: 10% [Individual]

Exam: 50% [Individual]

Class test 1: Tues Aug 6 [Individual]

Class test 2: Tues Oct 1 [Individual]

Final lab report: Fri Oct 25 [Individual]

Late Submission of Assessment

*Unless prior arrangement is made with the lecturer or a formal application for special consideration is submitted, a penalty of 5% of the total available mark for the assessment will apply for each day that an assessment item is late up to a maximum of 5 days (120 hours) after which an assessment can no longer be submitted and a grade of 0 will be applied.*

Use of Generative AI in Assessments

*PLANNING ASSISTANCE*

*As this assessment task involves some planning or creative processes, you are permitted to use software to generate initial ideas. However, you must develop or edit those ideas to such a significant extent that what is submitted is your own work, i.e. only occasional AI generated words or phrases may form part of your final submission. It is a good idea to keep copies of the initial prompts to show your lecturer if there is any uncertainty about the originality of your work.*

**Grading Basis**

Standard

**Requirements to pass course**

Overall passing mark is set at 50%

# Course Schedule

| Teaching Week/Module | Activity Type | Content |
|---|---|---|
| Week 1 : 15 July - 19 July | Lecture | 0. Introduction |
| | Laboratory | L0. Lab introduction and LTSpice tutorial |
| Week 2 : 22 July - 26 July | Lecture | 1. Circuit Analysis |
| | Laboratory | L1. DC Circuits |
| Week 3 : 29 July - 2 August | Lecture | 2. Operational Amplifiers |
| | Laboratory | L1. DC Circuits |
| Week 4 : 5 August - 9 August | Lecture | 3. Inductance and Capacitance |
| | Laboratory | L2. Operational Amplifiers |
| | Assessment | Class Test 1: Tues Aug 6 |
| Week 5 : 12 August - 16 August | Lecture | Slack |
| | Laboratory | L2. Operational Amplifiers |
| Week 6 : 19 August - 23 August | Lecture | 4. First-order Circuits |
| Week 7 : 9 September - 13 September | Lecture | 5. Second-order Circuits |
| | Laboratory | LTSpice tutorial |
| Week 8 : 16 September - 20 September | Lecture | 6. Sinusoidal Circuit Analysis |
| | Laboratory | L3. AC Circuits |
| Week 9 : 23 September - 27 September | Lecture | 6. Sinusoidal Circuit Analysis |
| | Laboratory | L3. AC Circuits |
| Week 10 : 30 September - 4 October | Lecture | Slack |
| | Laboratory | L4. AC Power |
| | Assessment | Class Test 2: Tues Oct 1 |
| Week 11 : 7 October - 11 October | Lecture | 7. Sinusoidal Power |
| Week 12 : 14 October - 18 October | Lecture | 7. Sinusoidal Power |
| | Laboratory | L4. AC Power |
| Week 13 : 21 October - 25 October | Lecture | Slack |

## Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

# Course Resources

## Prescribed Resources

Compulsory Texts:

- J. W. Nilsson and S. Riedel, Electric Circuits, 11th Edition (or later), Pearson.

**In addition to the above textbooks, the following tools are required for this course:**

- QM-1549 Digital multimeter (or equivalent).
- PB-8816 breadboard (or equivalent).

## Course Evaluation and Development

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey towards the end of this course.

Students can also provide feedback during the semester via: direct contact with the lecturer, the "On-going Student Feedback" link in Moodle, Student-Staff Liaison Committee meetings in schools, informal feedback conducted by staff, and focus groups. Student opinions really do make a difference. Refer to the Moodle site for this course to see how the feedback from previous students has contributed to the course development.

**Important note:** Students are reminded that any feedback provided should be constructive and professional and that they are bound by the Student Code of Conduct Policy

https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

# Staff Details

| Position | Name | Email | Location | Phone | Availability | Equitable Learning Services Contact | Primary Contact |
|---|---|---|---|---|---|---|---|
| Convenor | Matt Woolley | | Bldg 17, Rm 215 | Please email or message on Tea | By appointment | No | Yes |
| Lab supervisor | Toby Boyson | | | | By appointment | No | No |