UNSW Course Outline

ELEC2117 Electrical Systems Design - 2024

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General Course Information

Course Code : ELEC2117
Year : 2024
Term : Term 3
Teaching Period : T3
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Electrical Engineering & Telecommunications
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Electrical systems modelling and simulation are important tools for understanding, designing, and improving electrical systems. By developing mathematical models and running them on a computer, you can predict the behaviour of the system and its performance in various situations,

without needing to build physical prototypes. By simulating different scenarios and conditions, you can identify any flaws, inefficiencies, or risks in the design. You are also able to explore different design options, compare their outcomes, and optimise performance. Overall, electrical systems modelling, and simulation methods are powerful tools to gain insights, improve designs, reduce costs, and ensure the reliability and performance of electrical systems before they are built and deployed in the real world. They are core elements of the modern engineering workflow.

This course is a design-oriented course, in which you will carry out a practical electrical engineering system design. The design will be supported by relevant theory and practical proficiency gained earlier in the course.

The syllabus includes topics such as analogue and discrete-time systems, analogue filters, basic digital filters, concepts of time and frequency responses, simulation and modelling techniques, state-space representations, and the use of MATLAB/Simulink for designing analogue/discrete-time systems.

Course Aims

This second-year design course complements the design thread in the degree program, drawing from knowledge gained in first-year courses on electronic circuits, programming, and digital circuits. It is also assumed that students would have been exposed to introductory engineering design concepts, such as those gained from the first-year DESN1000 course.

This course will:

- enhance students' knowledge of electrical engineering design;
- enable students to learn mathematical approaches to system analyses and design;
- build students' confidence in implementing and validating their designs.

Relationship to Other Courses

This second year design course complements the design thread in the degree program, drawing from knowledge gained in first year courses on electronic circuits, programming, and circuits and systems. It is also assumed that students would have been exposed to introductory engineering design concepts, such as those gained from the first year DESN1000 course. ELEC2117 is a design-oriented course, in which students will carry out a practical electrical engineering system design in the second half of session. The design will be supported by relevant theory and practical proficiency gained in the first half of session.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Generate design criteria based on context of the problem.
CLO2 : Design, implement and validate electrical engineering systems to meet design criteria.
CLO3 : Communicate details of their design and challenges faced with implementation.

Course Learning Outcomes	Assessment Item
CLO1 : Generate design criteria based on context of the problem.	• Mid-Term Lab Assessment • Final Lab Exam • Design Project
CLO2 : Design, implement and validate electrical engineering systems to meet design criteria.	• Mid-Term Lab Assessment • Final Lab Exam • Design Project
CLO3 : Communicate details of their design and challenges faced with implementation.	• Final Lab Exam • Design Project

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

Delivery Mode

The entire analytical and design component of the course will be delivered via face to face lectures and face to face laboratories and discussions with assigned lab demonstrators.

Learning in this course

1. You are expected to learn from all integrated lectures/labs every week and participate in the weekly labs with allocated lab demonstrators.
2. You must prepare well for your weekly coding laboratory discussion with the demonstrators.
3. Each week, you must reflect on the content that you have learnt from the integrated lectures and the lab.
4. You must attend all the integrated lecture/labs sessions, design-project sessions, assessments, and exams.
5. Reading additional texts will further enhance your learning experience.
6. Group learning is also encouraged (each lab group will have 9-12 students per lab demonstrator).

7. For a primarily face-to-face course such as this course, it is *vital* that you undertake adequate self-directed study every week during the term. The Tiered Learning Taxonomy (TLT) - A self-driven learning framework (An overview is available on Moodle) will help guide you on this.

Other Professional Outcomes

Relationship to Engineers Australia Stage 1 competencies:

The Course Learning Outcomes (LOs) contribute to the Engineers Australia (National Accreditation Body) Stage I competencies as outlined below

Engineers Australia (EA), Professional Engineer Stage 1 Competencies

PE1: Knowledge and Skill Base:
PE1.1 Comprehensive, theory-based **understanding of underpinning fundamentals**: LO 1, 2
PE1.2 Conceptual understanding of underpinning maths, **analysis**, statistics, **computing**: LO 1, 2
PE1.3 In-depth understanding of specialist bodies of **knowledge**: LO 1, 2
PE1.4 Discernment of knowledge development and research directions: NA
PE1.5 Knowledge of **engineering design** practice: LO 1,2, 3
PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice: NA

PE2: Engineering Application Ability:
PE2.1 Application of established engineering methods to **complex problem solving**: LO 1,2,3
PE2.2 Fluent **application of engineering techniques**, tools and resources: LO 1, 2, 3
PE2.3 Application of systematic engineering synthesis and design processes: LO 1,2
PE2.4 Application of systematic approaches to the conduct and management of engineering projects: LO 1,2,3

PE3: Professional and Personal Attributes:
PE3.1 Ethical conduct and professional accountability: LO 3
PE3.2 Effective **oral and written communication** (professional and lay domains): LO 3
PE3.3 **Creative, innovative** and pro-active demeanour: LO 3
PE3.4 Professional use and management of information: NA
PE3.5 Orderly management of **self, and professional conduct**: LO 2,3
PE3.6 Effective team membership and team leadership: NA

This course is also designed to provide the course learning outcomes which arise from targeted

graduate capabilities. The targeted graduate capabilities broadly support the UNSW and Faculty of Engineering graduate capabilities (also listed below).

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

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 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

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Mid-Term Lab Assessment Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Not Applicable
Final Lab Exam Assessment Format: Individual	30%	Start Date: Not Applicable Due Date: Not Applicable
Design Project Assessment Format: Individual	50%	Start Date: Week 5 Due Date: Week 10

Assessment Details

Mid-Term Lab Assessment

Assessment Overview

There will be a 2-hour TLT framework-based, Mid-Term Lab Assessment in week 5, that tests students' understanding of mathematical approaches to system analysis, design, and implementation. It will cover material from Week 1 to Week 4. Assessment marks will be awarded according to your understanding of the topic revealed through lab demonstrator questions. Feedback will be provided in class during marking.

Course Learning Outcomes

- CLO1 : Generate design criteria based on context of the problem.
- CLO2 : Design, implement and validate electrical engineering systems to meet design criteria.

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

Assistance with Attribution

This assessment requires you to write/create a first iteration of your submission yourself. You are then permitted to use generative AI tools, software or services to improve your submission in the ways set out below.
Any output of generative AI tools, software or services that is used within your assessment must be attributed with full referencing.
If outputs of generative AI tools, software or services form part of your submission and are not appropriately attributed, your Convenor will determine whether the omission is significant. If so, you may be asked to explain your submission. If you are unable to satisfactorily demonstrate

your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.
For more information on Generative AI and permitted use please see here.

If you use generative AI systems to generate any part of your work or code, make it explicit. You are responsible for the entirety of your submission and any code that led to the submission including any mistakes made by the generative AI system. It is also expected that you are able to explain all parts of your submission including the bits produced by AI systems.

Final Lab Exam

Assessment Overview

At the end of the term, there will be a 3-hour TLT framework-based laboratory exam as a final test of the competency of the students. It will cover all material in the course and assess both theoretical and practical abilities. It will involve designing and implementing a system. Marks will be awarded according to the correctness of the responses.

Course Learning Outcomes

- CLO1 : Generate design criteria based on context of the problem.
- CLO2 : Design, implement and validate electrical engineering systems to meet design criteria.
- CLO3 : Communicate details of their design and challenges faced with implementation.

Assignment submission Turnitin type

Not Applicable

Hurdle rules

To successfully complete the course, it is essential to achieve a satisfactory performance of 50% or higher in the Final Lab Exam.

Generative AI Permission Level

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Design Project

Assessment Overview

The TLT framework-based design project will be an individual task assigned at the end of Week 5, and students are expected to complete it by the middle of Week 10. In Week 10, the project will be evaluated through a 20-30 minute presentation and a question and answer session. Students are required to submit their presentation slides (format will be provided in Week 9) by the middle of Week 10. The project presentation will be assessed based on the following criteria: (a) understanding of the project, (b) successful implementation, (c) presentation of results, (d) ability to answer questions, and (e) clarity of communication during the presentation. Feedback will be provided to the students after the design project assessment.

Course Learning Outcomes

- CLO1 : Generate design criteria based on context of the problem.
- CLO2 : Design, implement and validate electrical engineering systems to meet design criteria.
- CLO3 : Communicate details of their design and challenges faced with implementation.

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

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General Assessment Information

The course assessment aims to evaluate your progress throughout the term. You will be assessed through three assessment tasks: Mid-term Lab, Design Project, and a Final Lab Exam. The Design Tasks will be based on the TLT framework, and you will have the flexibility to choose the level you want to attain.

Students are required to complete the Level 2 (Pass) design as a minimum requirement. The maximum mark you can receive depends on the level you select, as indicated below:

- If you aim for Level 2, the maximum mark you can obtain is 64.
- If you correctly complete the Level 3 task, the maximum mark you can achieve is 74.
- If you correctly complete the Level 4 task, the maximum mark you can achieve is 84.
- If you correctly complete the Level 5 task, the maximum mark you can achieve is 100.

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Laboratory	Course Introduction & Julia Fundamentals
Week 2 : 16 September - 22 September	Laboratory	Programing Best Practices (Modular Programming, Version control, Unit testing)
Week 3 : 23 September - 29 September	Laboratory	Fundamentals of mathematical modelling with a focus on epidemiology
Week 4 : 30 September - 6 October	Laboratory	Implementation of computational models
Week 5 : 7 October - 13 October	Laboratory	Implementation of computational models
	Assessment	Mid-Term Lab Assessment
Week 6 : 14 October - 20 October	Project	Design Project
Week 7 : 21 October - 27 October	Project	Design Project
Week 8 : 28 October - 3 November	Project	Design Project
Week 9 : 4 November - 10 November	Project	Design Project
Week 10 : 11 November - 17 November	Project	Design Project
	Assessment	Design Project Evaluation

Attendance Requirements

Please note that lecture recordings are not available for this course. Students are strongly encouraged to attend all classes and contact the Course Authority to make alternative arrangements for classes missed.

General Schedule Information

Week 1-2 : Introduction to Julia programming language

Week 3:5 Fundamentals of mathematical modelling with a focus on epidemiology, Implementation of computational models

Week 5:10 Design Project

Course Resources

Prescribed Resources

This course has no specific recommended text. As it heavily relies on the technical knowledge of other courses, the textbooks of those subjects and their course notes are recommended resources for the students.

Course Evaluation and Development

This course teaches System Modelling and Simulation. Students will learn to create computer models to predict how a system will work in different situations. It helps in finding issues,

comparing design options, ensuring the system works properly, and providing important decision support. These techniques are essential in today's engineering processes. This redesigned course is being offered based on Tiered Learning Taxonomy (TLT) framework. The TLT framework includes 5 Hierarchical levels, and the taxonomy encourages students to think about which level they are currently at with their learning, and what they need to do in order to progress to the next level.

- Your feedback is valuable to improve the course. Please forward any feedback (positive or negative) on the course to the course convener. This will ensure we can make adaptive changes throughout the term.
- Towards Week 10, you will be asked by UNSW to provide feedback via the online student survey myExperience.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Vidhyasaharan Sethu					No	Yes
	Sirojan Tharmakulasingam					No	No

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular,

students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. 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 Equitable Learning Services. 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.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to

accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You 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 tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;

- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School-specific Information

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.

Use of AI for assessments

Your work must be your own. If you use AI in the writing of your assessment, you must acknowledge this and your submission must be substantially your own work. More information can be found on this website.

Workplace Health & Safety (WHS)

WHS for students and staff is of utmost priority. Most courses involve laboratory work. You must follow the rules about conduct in the laboratory. About COVID-19, advice can be found on this website.

School Contact Information

Consultations: Lecturer consultation times will be advised during the first lecture. 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 ELEC/TELExxxx 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.

Student Support Enquiries

For enrolment and progression enquiries please contact Student Services

Web

Electrical Engineering Homepage