

ELEC3117

Electrical Engineering Design

Term 2, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Beena Ahmed	beena.ahmed@unsw.edu.au	Thursday 12 -1 pm via Teams	EE&T 444	+61293854 025

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](#)

[Engineering Student Support Services](#)

[Engineering Industrial Training](#)

[UNSW Study Abroad and Exchange](#) (for inbound students)

[UNSW Future Students](#)

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)

Email

[Engineering Student Support Services](#) – current student enquiries

- e.g. enrolment, progression, 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

Course Details

Units of Credit 6

Summary of the Course

Design Project Management: Introduction to scheduling, costing, marketing, standards, patents, quality, safety, (electronic) manufacturing methods, engineering innovation, Report Writing and Oral Presentations. Design Methodology: Systematic design procedures, design documentation. Designing for quality, manufacture, maintenance, minimum life cycle cost. Aspects of Electronic Design: Component selection, tolerances, passive component characteristics. Also EMC, earthing and PCB layout principles. Engineering Drawing and Graphical Communications: Projections, dimensioning and drawing interpretation. Group Project: Students are required to design and build an electrical engineering project. This process will include producing specifications, detailed design, prototype production and testing. The Design will be presented in a seminar and documented in two formal technical reports that also consider scheduling, marketing and business plans.

Course Aims

The course aims to:

1. Expose students to the practical and technical challenges of serious Electrical Engineering design.
2. Develop teamwork and project management skills.
3. Provide a practical context for learning in other courses, so as to cement practical skills in electronic circuit design and reinforce the importance of disciplines such as control, signal processing, embedded systems, etc.
4. Impart an appreciation for the broader aspects of design, including consumer needs, marketing, product economics, manufacturing, standards, intellectual property and systems thinking.
5. Further develop written and oral technical communication skills.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Initiate, design, and manage an electronic design project	PE1.4, PE1.5, PE1.6, PE2.1, PE2.2, PE2.3, PE2.4, PE3.3
2. Demonstrate software skills with project management, circuit schematic, and PCB design software	PE1.5, PE2.1, PE2.2, PE2.3, PE2.4, PE3.5
3. Work in a small development team, write formal project reports,	PE3.2, PE3.4, PE3.5, PE3.6

Learning Outcome	EA Stage 1 Competencies
deliver a product development proposal, and present a technical seminar	
4. Recognise the conditions under which it is important to conduct patent searches, file patents, follow and/or contribute to standards	PE1.4, PE1.5, PE2.3, PE2.4, PE3.4
5. Apply knowledge of manufacturing processes, electromagnetic compatibility, safety, and other areas to the design of quality products	PE1.4, PE1.5, PE1.6, PE2.3, PE2.4, PE3.4

Teaching Strategies

The design project plays a major role in the learning process for this course, since it provides an opportunity for students to practice many of the methods which are taught in lectures. In particular, project management, electronic prototyping, properties of electronic components and many other areas of teaching in this course cannot be properly appreciated without undertaking a serious concurrent design project. Pre-recorded lectures will be made available on Moodle and supported with an at-home task followed by in-class discussion, with each of these tasks assessed. The lectures, notes and at-home tasks will provide valuable information to assist students in their projects, while also providing a broad framework for design, including many facets that cannot be experienced properly within a student project.

Additional Course Information

Pre-requisites and Assumed Knowledge

The pre-requisite for this course is ELEC2133, Analogue Electronics. It is essential that you have a reasonable background in Electronic Circuits before this course is attempted. It is further assumed that students have some familiarity with microcontrollers, as would be gained from ELEC2142, Embedded System Design, or similar.

Following Courses

The course is a pre-requisite for under-taking ELEC4951, Thesis A.

The following course in the design stream is ELEC4123, Electrical Design Proficiency – this is a core, Level 4 course. For students wishing to develop further in the entrepreneurial and small-business aspects should consider ELEC4445, Entrepreneurial Engineering, offered as a fourth-year technical elective

Learning in this course

Students are expected to attend all lectures and labs in order to maximise learning. The design project is at the centre of the course, and it is expected that it will require a significant amount of your time beyond the face-to-face scheduled class time (recall that the expectation for a 6 UoC course is that it would occupy 15 hours of student time per week). In addition to the lecture videos and notes, you should read

widely from a variety of relevant sources – the lectures cannot cover the specific technical details pertaining to your specific project, and you are expected to develop the skills to be able to research technical concepts independently. Reading additional texts will further enhance your learning experience. Group learning is also encouraged. UNSW *assumes* that self-directed study of this kind is undertaken in addition to attending formal classes throughout the course.

Lectures

Lecture videos cover technical aspects of detailed design, as well as broader aspects of design, including marketing and economics. All material covered in lecture notes is examinable, not just that which directly relates to student projects. Lecture notes and slides will constitute the reading material for each topic. By and large, the lecture notes are carefully prepared written materials, designed to be read.

Project/Laboratory program



The project is the major component of the work in ELEC3117. It represents over half of the total marks for the subject. Therefore, to do well in this subject you must do well in your design project. Failure to do so may result in a UF (Unacceptable Fail), even if your overall final mark is greater than 50%. This project requires much more than just designing and constructing an electronic circuit. It requires the consideration of a broad range of engineering and strategic business issues, such as target market, competition, costing, timing etc.

All laboratory sessions will be conducted in the laboratories in EE&T or online for online sections. In the laboratory sessions in weeks 1 – 4 (labs once a week), your focus will be on designing your project while in weeks 5 – 10 (labs twice a week) on building your project. In the lectures in Weeks 1 – 5, you will also have the opportunity to discuss your projects and issues you are facing with the lecturer, demonstrators and other teams.

Laboratory Exemption

There is no laboratory exemption for this course. Regardless of whether equivalent labs have been completed in previous courses, 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

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Project Development Proposal 	25%	03/07/2022 11:55 PM	1, 2, 3
2. Project Presentation	25%	Week 10	1, 2, 3
3. Final Project Report 	25%	11/08/2022 11:55 PM	1, 2, 3, 4, 5
4. Final Examination	25%	Not Applicable	4, 5

Assessment 1: Project Development Proposal (Group)

Due date: 03/07/2022 11:55 PM

Lab attendance and weekly project planning tasks

Attendance in the labs will be recorded and account for 4% of the total course marks. The weekly project planning tasks will account for an additional 5% of the total course marks also. In these assessed tasks, teams will need to work on components of their development proposal and will receive feedback on them so they have an improved final version to include in their final development proposal.

Advisory Board

Each project team will be assigned 2 other teams to act as their advisory board and expected to meet them at least 3 times during the term. The role of the advisory board will be to provide each team with advice of project directions and peer review their work. You will need to provide minutes of these meetings with your development proposal and final report and will be worth 1% of the total course mark.

Project Development Proposal

The first major group assessment for the design project is the Project Development Proposal, due at the end of Week 5 on Sunday the 3rd of July. This is a formal engineering report, containing a description of the product and design concepts, market assessment and analysis, economic and cost estimates, and development plan. The Project Development Proposal will account for 15% of the total course marks. Further details, including the detailed marking scheme, will be made available closer to the date. The Report must be submitted via Moodle.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Assessment 2: Project Presentation

Due date: Week 10

Design Progress Review

During the laboratory sessions in Week 8, project teams will be asked to demonstrate the status of their

prototype. Each project team will be allocated 10 minutes for the demonstration. This assessment task accounts for 5% of the total course grade. The focus of this progress review is to provide teams with an opportunity to get positive feedback on their project and ensure they have made sufficient progress on their prototype to have a functioning product for the Design Presentation in Week 10. In the review, teams are expected to have at a minimum at least one working subcomponent of their product.

Design Presentation

During the laboratory sessions in Week 10, teams will be asked to present their design and demonstrate a functional prototype. Each project team will be allocated 15 minutes for the seminar and demonstration – a timetable will be posted closer to the date. This assessment task accounts for 20% of the total course grade. The focus of the presentation is to emphasize the novelty in the design, the technical challenges and improvements required for the design to move into commercial development and demonstrate the functional prototype. The aim of this assessment is to give students experience in communicating technical ideas.

Assessment 3: Final Project Report (Group)

Due date: 11/08/2022 11:55 PM

Final Report

The final report is due by 11:55 pm of Thursday the 11th of August in Week 11, submitted through Moodle. The focus of the final report is on describing the detailed design and the subsequent plan for manufacturing/further development as well as the business plan. This assessment task contributes 25% of the total course grade. Further details of the final report will be provided closer to the date.

Late reports will attract a penalty of 10% of the maximum attainable mark per day late (including weekends). For example, if the report is two days late and achieves a raw mark of 87%, the final result for this report will be 80% (since this is the maximum attainable mark, given it is two days late). However, a report achieving a raw mark of 67% that is two days late will still achieve a final mark of 67.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Assessment 4: Final Examination

Final Exam

The exam in this course will be a take home open-book written examination, comprising three compulsory questions. The examination for this course focuses on the important aspects of the course curriculum that are difficult to cover through a student project – technical aspects such as electromagnetic compatibility and manufacturing limitations, as well as the important non-technical aspects of engineering design, such as patents, quality, safety, and standards. The final exam accounts 25% of the total course grade. *Please note that students must pass the final exam in order to pass the course.*

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Attendance Requirements

You are required to attend all lectures and laboratories. Attendance WILL be kept, and you MUST attend at least 80% of the lectures and laboratory sessions.

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
O-Week: 23 May - 27 May	Homework	Find Project Partner and Choose Project Topic
Week 1: 30 May - 3 June	Module	Introduction to Design, Market Assessment, Needs Assessment
	Group Activity	Survey Questions, Secondary Market Research, Needs Assessment
Week 2: 6 June - 10 June	Module	Requirements Analysis, Concept Generation
	Group Activity	Requirements Analysis, Problem Statement, Product Concept, Design Concept, Unique Selling Points
Week 3: 13 June - 17 June	Module	High Level Design, System Architecture, Choosing a Microcontroller, Choosing Electronic Components
	Group Activity	High Level Block Diagram, Technical Components
Week 4: 20 June - 24 June	Module	Business Plan, Business Case Examples, Project Costing, Project Management Importance, Project Management Process, Project Scheduling & Monitoring
	Group Activity	Manufacturing Costs, Potential Profitability, Work Breakdown Structure, Gantt Chart, Risk Assessment
Week 5: 27 June - 1 July	Assessment	Development Proposal
Week 6: 4 July - 8 July		
Week 7: 11 July - 15 July	Module	Trademarks & Copyrights, Patents
Week 8: 18 July - 22 July	Module	Standards. Quality Management Systems, Electromagnetic compatibility

	Assessment	Design Progress Review
Week 9: 25 July - 29 July		
Week 10: 1 August - 5 August	Assessment	Design Presentation
	Assessment	Project Presentation
Study Week: 8 August - 11 August	Assessment	Final Report
	Assessment	Final Project Report

Resources

Prescribed Resources

There are no required texts for this course. If there were one, it would be the first text from the following list of recommended books:

Recommended Resources

K.T. Ulrich and S.D. Eppinger, Product Design and Development, McGraw-Hill, 2000 (2nd edition).

This book provides a good overview of the design process with a number of relevant case studies to illustrate the methods discussed. It includes sections on product costing and project management, as well as methodologies for market analysis and concept generation. This text is easy and enjoyable to read and may be purchased from the UNSW bookstore. However, it does not touch on the details of electronic design, or a number of other topics covered in the course.

J.E. Salt and R Rothery, Design For Electrical and Computer Engineers, John Wiley & Sons, 2002.

This book covers key aspects of design at a high level, but with quite a few examples. Strong on user needs/requirements and high level design. Covers a variety of design approaches, project management, and costing issues. This text is easy to read and may be purchased from the UNSW bookstore. However, it does not touch on the details of electronic design, or a number of other topics covered in the course.

P. Horowitz and W. Hill, The Art of Electronics, Cambridge University Press, 1989 (2nd edition).

This book is an excellent reference for electronic design issues that may be required to complete your project.

D. A. Norman, The Design of Everyday Things, Currency-Doubleday, 1990. A very interesting read.

Ever wondered why you just walked into a door, or tried to pull a sliding door? This book discusses the design of the everyday objects that we take for granted.

Academic Honesty and Plagiarism

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>.

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.

Academic Information

COVID19 - Important Health Related Notice

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by [NSW health](#) or government authorities. Current alerts and a list of hotspots can be found [here](#). **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed.

If you are required to self-isolate and/or need emotional or financial support, please contact the [Nucleus: Student Hub](#). If you are unable to complete an assessment, or attend a class with an attendance or participation requirement, please let your teacher know and apply for [special consideration](#) through the [Special Consideration portal](#). To advise the University of a positive COVID-19 test result or if you suspect you have COVID-19 and are being tested, please fill in this [form](#).

UNSW requires all staff and students to follow NSW Health advice. Any failure to act in accordance with that advice may amount to a breach of the Student Code of Conduct. Please refer to the [Safe Return to Campus](#) guide for students for more information on safe practices.

Dates to note

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

Student Responsibilities and Conduct

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

Workload

It is expected that you will spend at least **15 hours per week** studying a 6 UoC course, from Week 1 until the final assessment, including both formal classes and *independent, self-directed study*. In periods where you 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.

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 can apply for special consideration when illness or other circumstances beyond your control interfere with an assessment performance. If you need to submit an application for special consideration for an exam or assessment, you must submit the application **prior to the start** of the exam or before the assessment is submitted, except where illness or misadventure prevent you from doing so. Be aware of the “fit to sit/submit” rule which means that if you sit an exam or submit an assignment, you are declaring yourself well enough to do so and cannot later apply for Special Consideration. For more information and how to apply, see <https://student.unsw.edu.au/special-consideration>.

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>

Disclaimer

This Course Outline sets out 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 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 (as updated in Moodle), the description in the Course Outline/Moodle applies:

Image Credit

Introduction to Design, ELEC3117 Notes (Beena Ahmed)

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering 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	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in 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	✓