School of Electrical Engineering and Telecommunications

Term 2, 2020
Course Outline

ELEC9123
Design Proficiency

COURSE STAFF

Course Convener: Dr. Matthew Priestley, Room EE314, m.priestley@unsw.edu.au
Telecommunications Tutor: Dr. Deepak Mishra, Room EE417, d.mishra@unsw.edu.au

Consultations: Please post any administrative questions in the Moodle discussion forums and email technical questions through to m.priestley@unsw.edu.au. You can also ask the laboratory demonstrators to answer any questions during the allocated laboratory times. ALL email enquiries should be made from your student email address with ELEC9123 in the subject line; otherwise they will not be answered.

Keeping Informed: All announcements regarding the course and its assignments will be made through 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.

COURSE SUMMARY

Contact Hours

The course consists of weekly four-hour lecture/laboratory classes starting in week 1. Note that more information on these classes will be given in the first class. There will also be weekly open lab classes starting in week 2. These sessions will allow students to get help from lab demonstrators and ask technical questions. Pre-recorded lectures may also be uploaded to Moodle to help with the understanding of particular content.

	Day	**Time**	**Location**
Lectures/Compulsory Labs	Friday (w1-10)	2pm – 6pm	Blackboard Collaborate
Open Labs	Wednesday (w2-10)	9am – 12noon	Blackboard Collaborate

Context and Aims

Although the theoretical skills that students acquire during their time at university form a strong foundation for their future career, companies have naturally been placing particular emphasis on the design skills of our graduates. The goal of this postgraduate course is to allow the students to demonstrate their ability to integrate the knowledge and concepts they have acquired so far and apply them to carry out practical design. In addition to assessing their design skills, this course gives the students the opportunity to identify and improve, with the help of the teaching staff, their design skills in individual streams being examined.
The aims of the course are to:

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

Indicative Lecture Schedule

Period	Summary of Lecture Program
Week 1	Introduction to course and important technical/design skills. Design Task 1 is given and explained.
Week 2	Work on Design Task 1
Week 3	**Design Task 1 assessment due**
Week 4	Design Task 2 is given and explained
Week 5	Work on Design Task 2
Week 6	Work on Design Task 2
Week 7	**Design Task 2 assessment due**
Week 8	Design Task 3 is given and explained
Week 9	Work on Design Task 3
Week 10	**Design Task 3 assessment due**

Assessment:

Assessment item	Assessment Weight
Design Task 1	35% (24% Design implementation; 16% Understanding)
Design Task 2	40% (24% Design implementation; 16% Understanding)
Design Task 3	20% (12% Design implementation; 8% Understanding)
Online Engagement/Participation Activity	5%
TOTAL	**100%**

The assessment consists solely of the three design tasks - there is no final examination.

Design Tasks – Design Tasks 1 and 2 are each worth 35% and 40% respectively. **You must pass both Design Tasks 1 and 2 to pass this course.** Design Task 3 is worth 20% and is much more difficult than the other tasks. You can pass this course without attempting Design Task 3, but you will not maximize your total course mark in this instance. Hence, Design Task 3 is meant to rigorously test your design and knowledge skills to achieve a high mark for this course. A student will get a chance to undertake a supplementary lab after the final week of the semester if a fail mark is achieved for Design Task 1 **or** 2 (not both).

The design tasks will focus on the field of microgrids. The first Design Task is in the field of digital signal processing for inverters. You must select either the topic of microgrid power system design or microgrid telecommunication system design for Design Tasks 2 **and** 3. Note that this decision will occur during week 2. It is recommended that the decision be based around which field best suits your background electrical engineering study and industry experience.

At the completion of the final week of each design task (Weeks 3, 7, and 10), the students are required to submit an Experiment Design Log (like a journal) via Moodle. In the design log, students will be able to self-reflect on their work and experiences with the design task. Students should provide a description of the research, design, experimentation, and successful and failed attempts towards their final design for the course. In the same log, the students should also provide a detailed reference and online resource list that they used in order to complete the design task. The Experiment Design Log will be reviewed during a seminar oral at end of Weeks 3, 7 and 10. In the seminar oral, a lab demonstrator will ask questions about the design to the student and will review the design log to assign a mark for design understanding (40% of the total mark of each design task). More detail on the design log and seminar oral will be provided during the term.

Online Activity/Participation – Student attendance at each compulsory Friday lab/lecture session will be recorded. At the completion of week 10, an attendance mark will be awarded out of 5% (where 5% is awarded for attendance at **all** Friday sessions from weeks 1-10). Missing a session will result in the 5% being scaled to reflect the number of attended sessions.

Deadlines

Topic selection for Design Tasks 2 and 3 (either Power or Telecommunications) is due in **Week 2**, **Tuesday 9th June** at **11pm**.

COURSE DETAILS

Credits

This is a 6 UoC course and the expected workload is 15 hours per week throughout the 10-week term.

Relationship to Other Courses

This is a postgraduate course in the School of Electrical Engineering and Telecommunications.

Pre-requisites and Assumed Knowledge

This is a postgraduate course that draws on knowledge and practical skills gained in your undergraduate degree. This course does not focus on teaching the design process itself, nor the basic theories and concepts of any of the streams or disciplines. Instead, the combination of the students' theoretical knowledge and design skills in these areas will be assessed. Consequently, this course is quite significant in preparing the student for the step from university life to the professional environment.

Learning outcomes

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

1. Have shown their capacity to successfully harness their technical knowledge to carry out meaningful design tasks in either the power or telecommunications field.
2. Have identified, documented and improved any issues related to their knowledge base.
3. Be able to identify and document the design requirements and the relevant concepts and resources in order to successfully reach the design goals.
4. Have the ability to combine various streams of electrical engineering to develop a solution to a design problem.

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***.

Syllabus

This course consists of design tasks in the areas of digital signal processing, and either microgrid telecommunications or microgrid power system design.

TEACHING STRATEGIES

Delivery Mode

The laboratories will form the primary method of instruction for this course. Students are also expected to perform design work outside of these laboratory sessions. During the lab session, students will be guided and supported by the lab demonstrators. However, as this is an assessment exercise, the staff will provide careful guidance such that the fundamental contribution to the design task remains that of the student. Essentially, this means emulating a realistic work environment where the engineer must have the fundamental knowledge and design skills but is able to solicit general guidance. The teaching methods adopted are optimized to ensure the aims and learning outcomes of the course are achieved.

These teaching methods include:

- Design tasks that are formulated to enable the students to combine their theoretical knowledge acquired from technical subjects.
- Assessments targeted at evaluating the students' abilities and identifying areas for improvement in their skill base.
- A lab oral seminar component that in addition to the evaluation of the design process, provides the opportunity for students to improve their presentation and communications skills, as well as their sense of working in an engineering community.
- Consultation to allow the students to seek assistance.

Learning in this course

The compulsory laboratories/lectures will form the primary method of learning for this course. You are expected to attend all compulsory labs/lectures and **must** attend the lab oral seminar to receive a mark for each Design Task. You must prepare well for your laboratory classes and it is expected that you will perform design work outside of these sessions. In addition to the lab work, you will have feedback sessions with your lecturer at the start of each new lab design. Furthermore, you will have the option of attending an open laboratory session to obtain guidance from lab demonstrators.

ASSESSMENT

Design Tasks 1, 2 and 3 will be marked during the Friday lab classes in weeks 3, 7 and 10, respectively. The assessment for each task is separated into two categories:

- Design implementation (60% of total assignment mark); and
- Understanding of design (40% of total assignment mark)

Marks will not be released during the term. Instead, feedback will be given at the completion of each new design task in the form of grades according to Table 1 for each assessment category. A student must pass Design Tasks 1 **and** 2 individually to pass the subject. This means that no grade of fail can be obtained for either assessment category in each of these two design tasks. Note that a failed assessment category will automatically mean that the student has failed that design task assignment. If a student fails either Design Task 1 **or** 2 (not both), they may receive a supplementary design task at the discretion of the course convenor during week 11. The final mark of a student performing a supplementary design task will be capped at 50% for that task. Finally, a student that has failed both Design Tasks 1 and 2 or has both failed one of these tasks and the supplementary design task will fail the subject. In this case, the final course mark will be the highest individual design task mark less than 50%.

If a student passes both Design Tasks 1 and 2 and has a perfect attendance record to the compulsory lab sessions, then they **will** pass the subject. This means that a minimum of the basic mark, from Table 1, must be achieved for both assessment categories in each of these design tasks. A student can pass this course without attempting Design Task 3, but they will not maximize their total course mark in this instance. Hence, Design Task 3 is meant to rigorously test a student's design and knowledge skills to achieve a high mark for this course.

Table 1: Course and Lab Grading

Marks Range	Grade
<50%	Fail
50 – 64%	Basic
65 – 74%	Satisfactory
75 – 84%	High
≥ 85%	Outstanding

Each Design Task has a minimum level of functionality to pass the design implementation category and hence pass the assignment. The design tasks also have a list of features that will generate a higher mark if completed for

the design implementation category. Correctly completing all features for a task will maximise the mark for the design implementation category.

Marking of a Design Task will take place in lab oral seminars during each Friday of weeks 3, 7 and 10. The seminar oral consists of a lab demonstrator checking that your simulation file performs correctly/incorrectly for each feature and the demonstrator assigning a grade for design implementation (60% of total assignment mark). The seminar also includes the demonstrator asking the student questions to test their understanding of their design and reviewing their experimental design log. The demonstrator will then assign a grade for design understanding (40% of total assignment mark). Note that these assessment seminar consultations are thorough and may take up to an hour for each student. The student will be asked about all different facets of their design during these sessions. If there are any suspicions that the design is not a student's own work, then this will be dealt with in accordance with UNSW Policy on Academic Misconduct. A student must ensure that the design is their own work. A cheating student will be easily identified during the seminar oral. The marking sessions will be conducted via Blackboard Collaborate. More information on these marking sessions, including the scheduling of the sessions on the Friday of weeks 3, 7 and 10 will be provided in the week before the task is due. Missing the scheduled seminar oral will constitute a fail grade for that assignment. A student who has missed a scheduled seminar oral may be allocated another session at the course convenor's discretion. This may include the allocation of a penalty to the design task grade at the course convenor's discretion.

Students will undertake each design task by themselves. Whilst a student may ask their peers a technical question, they must not copy a design. It will become obvious that a design has been copied during the seminar oral.

Final Exam

This course does not have a final exam.

Submission of Assessment Tasks

All design tasks must be conducted in MATLAB Simulink R2020a (using the Simulink and Simscape Electrical libraries). The Simulink simulation file and a design log must be submitted via the Moodle course page before Friday 8am the week that the task is due. The simulation files must be setup in a particular format as specified by each Design Task worksheet. A penalty may be given for any late submissions or submissions with formatting errors at the course convenors discretion.

Relationship of Assessment Methods to Learning Outcomes

	Learning outcomes			
Assessment	**1**	**2**	**3**	**4**
Laboratory practical assessments	✓	✓	✓	✓
Design Log		✓	✓	
Online Participation		✓	✓	

COURSE RESOURCES

Textbooks

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.

On-line resources

Moodle

As a part of the teaching component, Moodle will be used to disseminate teaching materials, host forums and submit assignment files. Lab assessment marks will also be available via Moodle Assessment marks: https://moodle.telt.unsw.edu.au/login/index.php.

Mailing list

Announcements concerning course information will be given in the lectures and/or on Moodle and/or via email (which will be sent to your student email address).

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.

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

Attendance at all Design Task Assessment days (Weeks 3, 7, 10) and at the start of each Design Task (Week 1, 4, 8) is mandatory. If you are unable to attend any of the Design Task Assessment days, you are required to notify the course convener and submit an application for special consideration. For further details, please see: https://student.unsw.edu.au/special-consideration

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 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.

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.

Based on the feedback from the last two years, the following suggestions have been considered:

1. To provide more, and clear, explanation of the design tasks to be implemented. It was felt that the specifications were too broad, meaning students struggled to focus on what was important in the time available.
2. To provide more open lab times, to allow the completion of the design tasks in a timely manner.

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 addresses a number of core UNSW graduate capabilities, as follows:

- 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 digital and information literacy and lifelong learning skills through assignment work.
- Developing independent, self-directed professionals who are enterprising, innovative, creative and responsive to change, through challenging design and project tasks.

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	