



THE UNIVERSITY OF
NEW SOUTH WALES

The School of Electrical Engineering and Telecommunications

ELEC4123 / TELE4123 / PHTN4123

Electrical/Telecoms Design Proficiency

Elias Aboutanios

Course Outline

Session 1, 2009

Course Staff

| | | |
|--|--|---|
| Course Coordinator and Lecturer in Charge | <i>Dr. Elias Aboutanios</i> | Room EE325 Phone: 9385 5010 Email: elias@unsw.edu.au |
| Tutors | <i>A/Prof Jinhong Yuan</i> <i>Alex Von Brasch</i> | Email: j.yuan@unsw.edu.au Email: a.vonbrasch@unsw.edu.au |
| Lab Demonstrators | To be announced | |

Class Times and Locations

| | | | |
|------------------|-------------------------------|---------------|------------------------|
| Lectures | <i>Elias Aboutanios</i> | Thurs. 9-10am | Science Theatre (F13*) |
| Tutorials | Tut1: <i>Jinhong Yuan</i> | Mon. 2-3pm | Quad 1045 (E15*) |
| | Tut2: <i>Alex Von Brasch</i> | Mon. 3-4pm | Quad 1045 (E15*) |
| | Tut3: <i>Elias Aboutanios</i> | Thurs 10-11am | Hut G02 (D10*) |
| Labs | Lab1: | Mon 9am-1pm | ElecEng101 |
| | Lab2: | Mon 9am-1pm | ElecEng102 |
| | Lab3: | Mon 9am-1pm | ElecEng125 |
| | Lab4: | Mon 9am-1pm | ElecEng113 |
| | Lab5: | Mon 9am-1pm | ElecEng114 |

*For the map references of the classroom locations see the [Campus Map \(click here\)](#).

Consultation

The lectures, tutorials and labs are the primary avenues of contact between the teaching staff and the students. The consultations are not meant to replace these, but to allow the students to raise concerns (or ask questions) they might have with the lecturer in charge should the standard contact channels prove inadequate. Initially, one consultation hour will be allocated on **Mondays from 1pm to 2pm** and will be conducted in **Room EE325**. Further consultations could be arranged by appointment. If required and deemed appropriate, additional consultation times could be allocated in the course of the semester and announced on the subject website.

Students may contact the lecturer by email to seek an appointment or ask a question. However, while every effort will be made, a response is not always guaranteed and the students are encouraged to take full advantage of the consultation hour.

Course Information

Course Load and Weight

This course is worth 6 units of credit (UoC).

The University defines a UoC as requiring 25 hours of total learning effort per semester (spread over lectures, tutorials, labs, and the student's own study time.) Therefore, it is expected that 150 hours will be allocated to this course. Counting the laboratories (approx. 35 hours per semester), tutorials (10 hours), Lectures (5 hours) gives a total of approximately 50 formal contact hours. The students should then allocate around 10 additional hours per week to the subject. This is in line with the expectation of 2 hours of study for every hour of formal contact.

Description and Objective

Whereas 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 subject is to allow the students to demonstrate their ability to integrate the various subjects and concepts (the theoretical foundations) they have acquired in the first three years of their degree and apply them to carry out practical design. In addition to assessing their design skills, this course gives the students the opportunity to identify, with the help of the teaching staff, weak points they might have in the streams being examined and provides them with a chance to mend those shortcomings. The objectives of the course are:

1. Provide the student with a realistic design experience where they are able to combine their theoretical knowledge acquired from the technical subjects with their design skills obtained from ENG1000 and ELEC/TELE3117.
2. Assess the students' performance and identify weaknesses in their skill base.
3. Give the students the opportunity to address those weaknesses and attempt the assessment a second time.
4. Allow the students who perform well (according to the conditions set in the rest of this document) to advance their design skills.
5. Prepare the students for the transition from the learning environment to the professional setting where these design skills are essential.

Organisation

The student will be assessed on practical design skills that are relevant to industry. For this purpose, we have identified four principal streams (for each of the ELEC and TELE/PHTN groups). Two of these streams are common to the ELEC/TELE/PHTN students. These streams are listed below:

Streams in common to the ELEC and TELE/PHTN strands:

- C1. Electronic Circuit Design: Devices, amplifiers, tuned circuits, opamp circuits, DC and AC analysis, component ratings and tolerances...
- C2. Signal Processing Design: Filter design, frequency response, spectrum analysis, BIBO gain...

Streams Specific to Electrical Design Competency:

- E1. Control System Design: Feedback and stability, linear control, non-linear control, data acquisition and sampling, real-time software control...
- E2. Power System Design: Transformer design, motor specifications, power factor management, electronic drive systems...

Streams Specific to Telecommunications Design Competency

- T1. Physical Communication Design: Baseband communications, AM/FM modulation, interference, multiplexing, power spectrum shaping, matched filters, phase locked loops...
- T2. Data Networking Design: IP addressing, router configuration, socket programming...

Additionally, the course will be divided into two stages:

- **Basic Design Proficiency:** This part comprises four (4) experiments, one on each of the relevant streams described above (C1, C2, E1, and E2 for ELEC4123 students, and C1, C2, T1, and T2 for the TELE/PHTN4123 students). Each of the experiments will be run in a four (4) hour lab session. This part is compulsory and a minimum standard must be achieved in it for the student to pass the subject (refer to the assessment section). It fulfills the requirement of testing the students on their ability to apply their engineering skills to basic design scenarios. Should the student fail any of the design tasks, they will have the opportunity to address the deficiencies in their knowledge before attempting the experiment a second time.
- **Advanced Design Proficiency:** This part may only be attempted provided the student has successfully completed the mandatory part above in the first round of experiments (by week 7). The advanced part requires the integration of some or all of the relevant streams into an overall design solution.

Relationship of the Course to the Program and Other Courses

This is a fourth year core subject that has all of the third year core subjects as pre-requisites. Coming into the course, the students should already have had significant experience in design from the first year ENG1000 subject and third year course ELEC/TELE 3117. Therefore, this course is not concerned with teaching the design process itself, nor the basic theories and concepts of any of the streams listed above. Instead, the combination of the student's theoretical knowledge and design skills in areas that are relevant to their future career will be assessed. Consequently, this course is quite significant in preparing the student for the step from the study to the professional environment. Furthermore, this course is different from the thesis as each design task has a narrow scope, and is targeted at specific areas of proficiency that will have high relevance to the Electrical Engineering profession. The thesis, on the other hand, is concerned with the overall successful completion of a major project from the specification stage, to the project management, and the final reporting.

Teaching Methods

The laboratories will form the primary method of instruction for this course. The students are expected to prepare for each of the design lab session prior to arriving at the laboratory. During the lab session, they 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 the student's. Essentially, this means that a realistic work environment where the engineer must have the fundamental knowledge and design skills but is able to solicit general guidance will be emulated.

The laboratories will be supported by the lectures and tutorials. There will be, in addition to the introductory administrative lecture of week 0, a total of five (5) lectures starting in week 1 that give the students an overview of the design process and each of the streams. The tutorials are an opportunity to discuss the weekly topics and solve some related review problems. The students will also have the opportunity to ask questions that are related to their design task as they prepare for it.

Learning Outcomes

As previously explained, this course is designed to test the students' design skills. Upon the successful completion of the subject, the student will

1. Have shown their capacity to successfully harness their technical knowledge to carry out meaningful design tasks in each of the competency streams listed above.
2. Have identified and corrected any issues or failings in their knowledge base.
3. Be able to identify the design requirements and the relevant concepts and resources in order to successfully reach the design goals.
4. Have demonstrated, in the case that the advanced part is attempted, the ability to combine various streams of Electrical Engineering to develop a solution to a design problem.
5. Be in a position to make a positive contribution to the workforce as a professional Electrical engineer.

Plagiarism

The University takes plagiarism very seriously and those committing this act are dealt with strictly. According to the University website, "*Plagiarism is taking the ideas or words of others and passing them off as your own. Plagiarism is a type of intellectual theft. Plagiarism can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. Plagiarism can have serious consequences...*"

In addition to being dishonest and unethical, plagiarism severely hinders the learning process of the person engaging in it. For more information please refer to [the UNSW Plagiarism Policy](#).

Assessment

The assessment consists solely of the lab exams and there is no final examination. The compulsory, Basic Design Proficiency, part is worth a maximum of 70%, and the Advanced Design Proficiency part accounts for 30% of the subject. The breakdown of the marks is as follows:

- **Basic Design Proficiency:** Each of the four experiments in this part is worth a maximum of 17.5% of the subject. The student must complete each of the experiments satisfactorily in order to pass the subject, with satisfactory completion requiring a mark of 12.5 or more out of 17.5. Should the student fail an experiment in the first round then, as explained above, they are allowed to retake it in the second half the semester. However, their mark for the repeated experiment will be capped at 12.5. That is, should they pass the experiment the second time, they will simply get 12.5 regardless of their performance. The assessment for each experiment will consist of three parts: the prior preparation, the design implementation, and the student's understanding.
- **Advanced Design Proficiency:** This part will be run in groups of 2 and the assessment will take into account the particular project being carried out. The students who pass the Basic part will have until Friday, 8 May 2009 (week 8) to submit a joint proposal for the advanced part.

Based on the above, the possible scenarios are summarised below, with $B1$ signifying an experiment successfully completed in the first round of labs, $B2$ representing a fail in the first round and success in the second, and A referring to the advanced part. In all cases, the minimum achievable mark to pass the subject is 50%. The maximum is given in the table for each scenario.

Table 1: laboratory Assessment Details

| <i>Assessments Completed</i> | <i>Max. Score (/100)</i> |
|------------------------------|--------------------------------------|
| $4 \times B1 + A$ | $4 \times 17.5 + 30 = 100$ |
| $3 \times B1 + B2$ | $3 \times 17.5 + 12.5 = 65$ |
| $2 \times B1 + 2 \times B2$ | $2 \times 17.5 + 2 \times 12.5 = 60$ |
| $1 \times B1 + 3 \times B2$ | $17.5 + 3 \times 12.5 = 55$ |
| $4 \times B2$ | $4 \times 12.5 = 50$ |

Submission of the Advanced Project Proposal

Students intending to attempt the advanced part must do so in groups of two (2). Each group must submit, by Friday, 8 May 2009, a single proposal for the design task they decide to carry out. This proposal must be a maximum of two pages and must clearly state the following:

- The names and student numbers of the group members.
- The title of the project.
- A description of the design objective, including the function it is intended to fulfil and its context.
- The design method and relevant concepts and resources. The students should refer to the design streams listed above and state those they will use. As a requirement, they should select at least one of the common streams (that is C1 and C2) and one of the specific streams (that is E1 and E2 for ELEC4123, and T1 and T2 for the TELE/PHTN4123).
- A brief plan, including a time line, for reaching their goal.

The students should keep in mind that the assessment for this project will take place in the lab session of week 12. Therefore, they should ensure that the proposed project can be planned and executed in this timeframe and with the available resources. The proposals will be assessed in the light of these criteria and the groups informed as soon as practial. The proposal will count for a third of the marks allocated for the advanced part (that is 10/30). Only groups with satisfactory proposals will be allowed to proceed. To this end, the students are encouraged to discuss their ideas with their lab demonstrators, tutors, and the lecturer prior to submitting their proposal.

Course Schedule

The preliminary course schedule is shown in the table below. Note that as this is a new course, this program is subject to change as necessary to improve students' experience.

Table 2: Session 1 Preliminary Course Schedule

| <i>wk:</i> | <i>Activity</i> | - | <i>Topic</i> |
|------------|-----------------|---|--|
| 0: | Lecture | - | Introduction and Administrative Matters |
| 1: | Lecture | - | Overview of the Design Process. |
| 2: | Lecture | - | Review of Electrical Circuits. |
| | Tutorial | - | The Design Process. |
| 3: | Lecture | - | Review of Signal Processing Concepts. |
| | Tutorial | - | Electrical Circuits. |
| | Laboratory | - | Introductory Lab. |
| 4: | Lecture | - | Review of Control/Communications Systems. |
| | Tutorial | - | Signal Processing Theory. |
| | Laboratory | - | Electrical Circuit Design. |
| 5: | Lecture | - | Review Power Systems/Networks. |
| | Tutorial | - | Control/Communications Systems. |
| | Laboratory | - | Signal Processing Design. |
| 6: | Tutorial | - | Power Systems/Networks. |
| | Laboratory | - | Control/Communications System Design. |
| 7: | Tutorial | - | Electrical Circuits. |
| | Laboratory | - | Power Systems/Networks Design. |
| 8: | Tutorial | - | Signal Processing Theory. |
| | Laboratory | - | Electrical Circuit Design/Advanced Design. |
| 9: | Tutorial | - | Control/Communications Systems. |
| | Laboratory | - | Signal Processing Design/Advanced Design. |
| 10: | Tutorial | - | Power Systems/Networks. |
| | Laboratory | - | Power Systems/Networks Design. |
| 11: | Tutorial | - | Advanced Design Task. |
| | Laboratory | - | Power Systems/Networks Design. |
| 12: | Laboratory | - | Advanced Design Task Assessment. |

Resources

Recommended Texts: This course has no specific recommended text. As it heavily relies on the core subjects of the third year of the degree, the textbooks of those subjects and their course notes are recommended resources for the students.

Links: The primary source of information and resource for this course should be the *subject website*, which can be accessed at using your student number and unipass. Additionally, the students are encouraged to use the resources of the third year subjects available from their websites, which are accessible at <https://subjects.ee.unsw.edu.au/>.

Other Resources: The students are reminded that the UNSW library is an excellent resource.

Continual Course Improvement

This course is under constant revision in order to improve the learning outcomes for the students. Any constructive feedback would be greatly appreciated and can be communicated to the lecturer in charge. Also we encourage the students, at the end of the semester, to provide us with their Please forward any feedback (positive or negative) on the course and their experience of it via the Course and Teaching Evaluation and Improvement Process.

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's policies and procedures*.