COURSE STAFF

Course Convener: Dr Dipan Kundu, Room E10 (Hilmer) 222, d.kundu@unsw.edu.au
Organizational contact: Mr Kevin Duquette, k.duquette@unsw.edu.au

Consultations: You are encouraged to ask questions via the Moodle discussion forums, but you are also welcome to email them directly. ALL email enquiries should be made from your student email address with ENGG3060 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 and Microsoft Teams (your team will be added to a channel on teams). 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 contact hours consist of mainly team-mentor meetings of various kinds, and some interactive lectures, workshops, and team presentations. The project will be undertaken in teams (of typically 3-4 students) and consists of regular meetings as a team plus active team work on your project. A minimum of one online meeting every week for at least one hour is mandatory and needs to be recorded for assessment purposes. The project will require experimental work, and thus laboratory assistance from relevant staff.

Duration of academic mentor meetings would be generally 45 minutes/week. Except for the industry mentor meeting – which would be organized as per the industry mentor’s discretion, all other meetings would be conducted on MS teams.

This year, the challenge program will be conducted in two stages: Term 2 - Stage 1 and Term 3 – Stage 2. In Stage 1, student teams will develop a promising design to solve the challenge and in the Stage 2 the teams will build a working prototype. Teams will work closely with their industry and academic mentors towards finding a solution for the challenge.

Indicative Course Schedule (for Term 2 only)

<table>
<thead>
<tr>
<th>Before Week 1</th>
<th>Mentor Meetings</th>
<th>Course Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact your industry mentor to understand the challenge – to define the problem statement</td>
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</table>
| Week 1 | Initial meeting with industry mentor  
Initial meeting with academic mentor  
Record minutes, actions | **Lecture Tuesday 5-6 pm**  
*Online – All students must attend*
 |
| Week 2 | Academic mentor meeting  
Minutes, actions, follow-up | **Tuesday 5-6 pm, Online**  
*Workshop: Conceptual Design*
 |
| Week 3 | Academic mentor meeting  
Minutes, actions, follow-up | **Tuesday 5-6 pm, Online**  
*Workshop: Design Thinking*
 |
| Week 4 | Academic mentor meeting  
Industry mentor meeting  
Minutes, actions, follow-up |  |
| Week 5 | Academic mentor meeting  
Minutes, actions, follow-up | **July 5, Sunday, 12 midnight:**  
*Deadline for Project Design Report (via Moodle and MS Teams)*
 |
| Week 6 |  | **Flexibility Week**
 |
| Week 7 | Academic mentor meeting  
Minutes, actions, follow-up | **Tuesday 5-6 pm, Online**  
*Workshop: Pitching – Founders/MCIC*
 |
| Week 8 | Industry mentor meeting  
Academic mentor meeting  
Minutes, actions, follow-up |  |
| Week 9 | Academic mentor meeting  
Minutes, actions, follow-up |  |
| Week 10 | Industry mentor meeting  
Academic mentor meeting  
Minutes, actions, follow-up |  |
| Week 11 | Academic mentor meeting  
Minutes, actions, follow-up |  |

*The workshop dates might change, or an additional workshop might be added, but any change would be communicated in advance.*

**Assessment Summary**

| Weekly Updates | 10% |
| Project Design (Report) | 20% |
| Progress Report (Presentation) | 25% |
| Final Presentation and Demonstration | 25% |
| Final Report | 20% |

**Overall**

| Weekly Updates | 10% |
| Project Design (Report) | 40% |
| Progress Report (Presentation) | 50% |

**Term 2 (UoC:3)**
COURSE DETAILS

Credits
This is a 6 UoC course: 3 UoC for Term 2 and 3 UoC for Term 3 and the expected workload is 150 hours in total, equally divided over two terms.

Relationship to Other Courses
This is intended as a 3rd year course in the Faculty of Engineering available to students in many engineering programs. It will most often be taken as an elective.

Pre-requisites and Assumed Knowledge
The pre-requisite for this course is completion of 96 UOC in an engineering program. Students will draw heavily on knowledge from previous courses such as ENGG1000 and other theory, design, project and professional skills courses within their program. However the course does not require specific assumed knowledge.

Learning outcomes
After successful completion of this course, you should be able to:

1. Define and respond effectively to a problem statement developed from an industry-supplied brief, and hence generate a compelling conceptual design
2. Source detailed relevant technical information, perform competitor analysis and hence generate multiple alternative design options for the various components of a proposed conceptual design
3. Develop an effective detailed design including principles from third-year and later engineering courses, precisely specify this design in written and oral form, and critically evaluate its merits
4. Plan, conduct and improve the design based on preliminary/unit and integration testing and a precise definition of 'success', to produce a functional final prototype that can be convincingly demonstrated
5. Apply coordinated, sustained and effective team effort and critical thinking at all stages from an initial pitch through to delivery of a compelling, persuasive and user-focused solution to a supplied brief

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 elective course allows you to deliver a project, of your own design, that engages the strength of cross-disciplinary student teams. You will develop, manage, solve and report on a project, based on a significant problem initiated by your industry mentor (who acts as both a client and a mentor). The course develops project and planning skills and introduces you to the concept of 'success' criteria. The project requires that you work in a cross-disciplinary team with the skill-set required to undertake largely self-identified tasks.

Term 3 (UoC:3)

Week 1
Weekly Updates

Week 2
Project Design (Report)

Week 3
Progress Report (Presentation)

TOTAL
100%

Weekly Updates 10%
Project Design (Report) 40%
Progress Report (Presentation) 50%
TEACHING STRATEGIES

Delivery Mode
The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal online/face-to-face weekly workshops, which provide guidance on various aspects of prototype development and entrepreneurship to aid your understanding.
  - These will be highly interactive and focused advice that is relevant to your team’s status, progress and needs.
- Weekly meetings with academic mentors, who will guide you through your self-learning for the project, and check that you are making progress against the learning outcome for the course. They will also provide technical guidance for your prototype design.

All course content would be uploaded on Moodle and MG MS Teams channel.

Duration of academic mentor meetings would be generally 45 minutes/week. Except for the industry mentor meeting – which would be organized as per the industry mentor’s discretion, all other meetings would be conducted on MS teams.

Learning in this course
You are expected to attend all classes and submit all assessments, to engage with all online leaning components, and to follow your team’s project plan to maximize learning. You must meet regularly with your team, using online collaboration tools (face-to-face, when UNSW allows). You must prepare well ahead of all classes, meetings and assessments.

Sourcing and reading multiple external information sources and online resources will be a key part of the background work for the prototype development, and self-directed study of this kind will be expected to produce quality design alternatives.

Enquiry-based learning
Before carrying out any project work, it is essential to be aware of what work has already been done by other engineers, otherwise, your solution may seem trivial to your client. You can ask your mentor for assistance with the available resources and how to access them, e.g. the IEEE-Xplore online database. Given the timeline for the project, it will be essential for you and your team to very rapidly grasp the underlying problem and challenges early in the term. Defining the problem precisely is difficult, but it is probably your most important task. Once you have a clear idea of exactly what the problem is to be solved, you can then develop and analyze the alternative courses of action available for achieving your goal. However, if your problem statement is vague and you have only a weak understanding the problem, then no amount of brilliant analysis or design will achieve the required objective.

Project Teams
It is expected that teams will typically consist of 4-5 students crossing a minimum of three different discipline skill sets across single or dual engineering degrees. Teams of more than 4-5 students may be approved, subject to a determination that the team skills match the project need and that skills are not excessively duplicated.

The purpose of the course is for you to undertake directed project work (both self-directed research and self-directed laboratory work) on an industry-provided brief under the guidance of both an academic supervisor and an industry ‘client’. The project provides an opportunity for you to bring together engineering principles learned over your previous years of study and more advanced principles and apply these to innovatively solve an industry problem. The projects are complex, open-ended problems that allow room for student creativity, and the acquisition, analysis and interpretation of results. There
must be multiple possible solutions and complexity requiring the application of engineering methods and skills typical of third year (or above) engineering. You will also develop skills that enable you to work in a startup or research and development style environment. As this is a team project, you should discuss how each team member will make an individual contribution to the problem solution.

ASSESSMENT

The assessment scheme in this course reflects the intention to assess your learning progress through the term. Please note that while ENGG3060 is a team project, every assessment item has a significant individual assessment component. All students enrolled in ENGG3060 (including those taking it as industrial training) are required to complete the assessments (contributions from all team members should be clearly identified in team submissions). Teams with students taking this program as coursework must upload all the assessment items on Moodle. Otherwise, all teams would need to upload all assessment items on their respective MS teams channel.

Weekly Updates (10% and must be satisfactory to pass course)

It is expected that every week, your team will be meeting online/face-to-face between 1-2 times, besides meeting with the academic mentor. To make any real progress, you will need to make notes (minutes) on progress/design/issues/planning, including an update on progress from each individual team member, and record action items, which will be clearly defined, be assigned to one or more team members and have a deadline. Your team must record these and upload one weekly update document per week on Moodle (if one of several team members are getting course credit) and on your assigned Microsoft Teams Channel.

Project Design – Report (20%)

This task is to work from your industry brief to develop a fairly short written report including:

- A clear, precise problem definition
- A literature review (research) and competitive analysis
- A carefully thought-out conceptual design
- Three alternative design concepts for each component of the conceptual design, and a comparison of the advantages and challenges associated with each
- A detailed project plan, showing reasoning
- A precise description of what ‘success’ looks like for the proposed solution

This is a group assessment task, and 20% of the total mark for this assessment will be based on the group effort (which includes how coherently the entire report is written). However, the report sections must be numbered, and you must identify on the cover sheet which sections of the report were written by which individuals.

The report must be submitted via the Moodle submission portal. Late submissions of reports will attract a penalty of 10% of the maximum attainable mark per day (including weekends).

Marks will be assigned according to the detail with which the above criteria are addressed, the extent of background research and competitive analysis, the clarity of the project objective, the feasibility of the project for the team who will undertake it, how compelling the expected project outcomes are, and the degree of challenge in the project objectives and plan.

Progress Report Presentation and Demonstration (25%)

Midway through the term, teams will present a progress report in the form of a detailed presentation to a panel of academic mentors and industry mentor, which should include demonstrations of parts of the
prototype. Team members will individually present parts of the design to the panel, and feedback will be provided.

The presentation must include:

- Motivation
- Introduction (must contain a problem statement)
- Relevant knowledge
- Clear explanation of design concept, including evidence of response to feedback on the Project Design submission
- Report on preliminary practical work to date
- Risk management
- Project plan developments (plans should be forward-looking, to Week 10/11)
- Evaluation plan (how will you measure success?)
- Summary

The progress report will contain a significant number of diagrams, and must show evidence of significant technical development. Typically, this will mean for example familiarity with the tools required to build the solution and results from preliminary experimental work (e.g. solving a cut-down version of the problem or sub-problem) and prototyping and/or simulations. An absence of any experimental/practical work should be taken by the team as a warning of likely failure of the course.

This report is a group assessment task, and 20% of the total assessment mark will be based on the group effort (which includes how coherently the entire presentation is given). However it must be clear which sections of the presentation were contributed by which individuals.

Marks will be assigned according to the collection, analysis and synthesis of relevant information; a clear understanding of the design process, especially requirements, conceptual design, detailed design and evaluation plan; technically precise communication of findings to date (including clear, fully detailed technical figures that explain concepts very effectively); demonstrations of parts of the design (this will be the most heavily weighted); formative experiments (evidence of mastery of relevant background knowledge/analysis/tools and clear detailed statements/plans about what remains to be done/resolved and how it will be done/resolved); style and structure; clarity and coherence of presentation; and group collaboration and teamwork.

Final Presentation and Demonstration (25%)

Teams will present their project outcomes to panel of academic staff around the time of (but not at) the Maker Games Showcase Day. This will comprise a formal presentation of the project outcomes and an informal demonstration of the delivered prototype(s). The final presentation demonstrates how the problem has been addressed, how the prototype functions, how it meets the industry partner’s needs/criteria, how it performs according to relevant evaluation criteria, and how it will operate in the context of the industry environment from which the brief was originally developed. Since the project represents several hundred hours of total team effort from throughout the term, demonstrations should be expected to reflect this extent of collective effort in the depth and quality of work presented. The presentation must have clear contributions from all team members, and should showcase the skills and contributions of all team members.

This presentation is a group assessment task, and 20% of the total mark will be based on the group effort (which includes how coherently the entire presentation is communicated).

Marks will be assigned according to the extent to which the original problem statement has been addressed and the degree of challenge of the problem, how carefully the prototype has been positioned relative to competitor or alternative possible solutions, how well the project has been planned and executed, the creativity/innovation, how convincing the demonstration is, the evaluation against agreed
criteria and outcomes from the Project Design stage, the precision and professionalism of the technical presentation, and the coherence of the team presentation.

Final Report (20%)

At the end of the term, teams will provide a final, comprehensive report for assessment, addressing all project components and agreed deliverables. The report is to be presented as a series of sections, with one or more section by each individual. The team as a whole will write an introduction and the outcomes sections. Since the project represents several hundred hours of total team effort from throughout the term, reports should be expected to reflect this extent of collective effort in the depth and quality of work presented. The final report must attach the marked project design report as an appendix, so that the team's response to the earlier report feedback can be assessed.

This is a group assessment task, and 20% of the total assessment mark will be based on the group effort (which includes how coherently the entire report is written). However the report sections must be numbered, and you must identify on the cover sheet which sections of the report were written by which individuals.

The report must be submitted via the Moodle submission portal. Late submissions of reports will attract a penalty of 10% of the maximum attainable mark per day (including weekends).

Marks will be assigned according to the provision of a precise specification of the prototype (both in overview, for the non-expert reader, and in detail, so that it could be manufactured exactly based only on the content written in the report); a clear presentation of the evaluation of the prototype, including all preliminary/unit testing (test/comparison of alternative solutions would be ideal); explanation of how user feedback has been accounted for in the prototype; the findings and conclusion reached; the style, structure and presentation of the report; and group collaboration and teamwork.

Students must pass both the final presentation and final report to pass the course. As this is a 6 UOC course, it is expected that these assessments will reflect at least 150 hours of effort per student enrolled in ENGG3060. Expectations of industry mentors may be higher still.

Relationship of Assessment Methods to Learning Outcomes

<table>
<thead>
<tr>
<th>Assessment</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>Project Design</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Progress Report</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Final Presentation and Demonstration</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Final Report</td>
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<td></td>
<td></td>
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<td>✔</td>
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Textbooks

There is no prescribed textbook for this course. Extensive use of information from books and online materials is expected to be required, however this will vary from one team to the next.

Online Resources

Moodle

As a part of the teaching component, Moodle will be used to disseminate teaching materials, host forums and occasionally quizzes. Assessment marks will also be made available via Moodle: https://moodle.telt.unsw.edu.au/login/index.php.
Guidance on project formulation, planning, pitching and report writing

In the current era, there are a vast range of resources available to support your learning and project execution skills. The resources below can be treated as examples of these, but further online searches will reveal other very useful resources:

Project formulation
- [https://www.sheffield.ac.uk/polopoly_fs/1.440722!/file/HowtoWriteaProblemStatement.pdf](https://www.sheffield.ac.uk/polopoly_fs/1.440722!/file/HowtoWriteaProblemStatement.pdf)
- [https://www.wikihow.com/Write-a-Problem-Statement](https://www.wikihow.com/Write-a-Problem-Statement)

Project planning
- [https://www.openproject.org/](https://www.openproject.org/)

Project pitching

Report writing

Mailing list
Announcements concerning course information will be given in classes and/or on Moodle/MS Teams and/or via email (which will be sent to your UNSW student email address).
OTHER MATTERS

Dates to Note
Important Dates available at: https://student.unsw.edu.au/dates

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/guide), and particular attention is drawn to the following:

Workload
It is expected that you will spend at least fifteen hours per week studying a 6 UOC course, from Week 1 until the final assessment, including face-to-face and online activities and independent, self-directed study. In periods where you need to 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 classes and activities they may be refused final assessment.

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 should seek assistance early if you suffer illness or misadventure which affects your course progress. All applications for special consideration must be lodged online through myUNSW within 3 working days of the assessment, not to course or school staff. For more detail, consult https://student.unsw.edu.au/special-consideration.

Continual Course Improvement
This course will be revised 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. Your feedback will be used to inform future instances of this course, including delivery and assessment methods, to provide a rich and meaningful learning experience.
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 Faculty 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 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 digital and information literacy and lifelong learning skills through assignment work.
- Developing ethical practitioners who are collaborative and effective team workers, through group activities, seminars and tutorials.
### Appendix C: Engineers Australia (EA) Professional Engineer Competency Standard

<table>
<thead>
<tr>
<th>Program Intended Learning Outcomes</th>
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<tbody>
<tr>
<td><strong>PE1: Knowledge and Skill Base</strong></td>
</tr>
<tr>
<td>PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals</td>
</tr>
<tr>
<td>PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing</td>
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<tr>
<td>PE1.3 In-depth understanding of specialist bodies of knowledge ✔</td>
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<tr>
<td>PE1.4 Discernment of knowledge development and research directions ✔</td>
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<tr>
<td>PE1.5 Knowledge of engineering design practice ✔</td>
</tr>
<tr>
<td>PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice ✔</td>
</tr>
<tr>
<td><strong>PE2: Engineering Application Ability</strong></td>
</tr>
<tr>
<td>PE2.1 Application of established engineering methods to complex problem solving ✔</td>
</tr>
<tr>
<td>PE2.2 Fluent application of engineering techniques, tools and resources ✔</td>
</tr>
<tr>
<td>PE2.3 Application of systematic engineering synthesis and design processes ✔</td>
</tr>
<tr>
<td>PE2.4 Application of systematic approaches to the conduct and management of engineering projects ✔</td>
</tr>
<tr>
<td><strong>PE3: Professional and Personal Attributes</strong></td>
</tr>
<tr>
<td>PE3.1 Ethical conduct and professional accountability ✔</td>
</tr>
<tr>
<td>PE3.2 Effective oral and written communication (professional and lay domains) ✔</td>
</tr>
<tr>
<td>PE3.3 Creative, innovative and pro-active demeanour ✔</td>
</tr>
<tr>
<td>PE3.4 Professional use and management of information ✔</td>
</tr>
<tr>
<td>PE3.5 Orderly management of self, and professional conduct ✔</td>
</tr>
<tr>
<td>PE3.6 Effective team membership and team leadership ✔</td>
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</tbody>
</table>