

ENGG3600 Vertically Integrated Projects

Course Outline

Term 1-3, 2020

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Version control

Changes will not ordinarily be made to Course Outlines once published, especially so for assessment structure. Sometimes, however, it may be necessary to make minor adjustments, such as to the course schedule. Such changes will be documented here.

Revision	Date	Changes
0	20/12/2019	Initial version
1	07/02/2020	Updated dates and prerequisite information
2	11/02/2020	Update to time expectations and workshop names
3	22/05/2020	Updated workshop times for Term 2

1. Staff

Course Authority for the Faculty of Engineering

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Contacts for the projects

The following table lists the project coordinators for this course. The table also provides their contact details. *Emails and phone calls to the lecturers or the coordinator should only be for personal reasons* (e.g. absences, sickness and special consideration). If required, individual consultations may be arranged. However, questions about the course content or assessments should be posted on the MS Teams site/Moodle Forum provided.

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Mobile Water Recycling Dr Matthew Lee Location: Room VA127, Vallentine Annexe (H22) Phone: 9385 6139 Email: mattlee@unsw.edu.au	NextGEN Energy Storage Assoc. Prof. Chris Menictas Location: Room 402F, Ainsworth Building Phone: 9385 6269 Email: c.menictas@unsw.edu.au	Off-World Robotics Dr Arash Khatamianfar Location: Room 313, EEB Phone: 9385 5231 Email: a.khatamianfar@unsw.edu.au
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2. Course information

Units of credit: This is a 6 unit of credit course that runs across the year as 2 credit points per term. You will have 5 contact hours per week.

Pre-requisite (except Computer Science and Food Science program):

ENGG1000 – Introduction to Engineering Design and Innovation (Undergraduate)

Pre-requisite conditions:

1. Must have completed at least 72 UoC
2. Must be enrolled in a program offered by the Faculty of Engineering
3. Must be in good academic standing
4. Need to have completed the following if required by your projects:
 - Makerspace safety induction
 - Digital Fabrication for Engineering
 - Relevant lab and space inductions
 - Leadership and teamwork courses (if applicable)

Regular team meetings will be organised directly by your project coordinator. Attendance is compulsory. Refer to the course schedule for the times and locations for the face-to-face professional development sessions.

2.1 Course summary

This course is designed for highly motivated undergraduates seeking the opportunity to integrate specific curricular and co-curricular components into their undergraduate program, to provide them with enhanced preparation and experience in the areas of leadership and project management as it relates to engineering research and/or design, and thus giving them a head start when seeking employment.

The course runs across three consecutive terms within a single calendar year: T1, 2 and 3 (2 UoC per Term) for a total of 6 UoC at the end, which enables students to extend their project-based learning experience beyond a single term.

You must complete all three terms of the course and satisfy all assessment requirements as set out by the project coordinator to receive full course credit. Partial credits will not be given.

Students will pursue research or project execution in their selected projects, explore interdisciplinary research and development, gain a global perspective, develop an entrepreneurial mindset, or give back to the community through service learning. Benefits for participating can include unique opportunities and experiences, mentoring by academic supervisors, guest speakers, and funding opportunities and engagement with industry partners.

Under the guidance of academic and industry mentors, this course provides a vehicle for guided but independent group project work on varying briefs. The learning and effort in the course are largely team-based, with team-members ideally being drawn from different discipline areas. Students will develop their skills in critical thinking, problem definition, creative and systematic design, precise written and oral technical communication skills, and professional skills including communication and team organisation and coordination. The course allows students to design, build and research a variety of projects.

ENGG3600 is the second course in a "vertical" sequence of project-based learning courses, with ENGG2600 and ENGG4600 also offered, and thereby allows students an opportunity to engage again at a more senior level and attain more advanced skills.

2.2 Course aims

This course enhances student's teamwork, design skills and independent study skills through a student-driven design project or through academic-driven research. It aims to develop students critical thinking skills, and their ability to define and respond to a specific problem or project or research outcome. Professional skills such as teamwork, written and oral skills, strategic thinking and organisational skills are desired outcomes from this course.

2.3 Course learning outcomes (CLO)

At the successful completion of this course:

1. (Research/Enquiry) Students will be able to apply engineering and enquiry-based methods in the pursuit of solving a team-based multidisciplinary engineering problem.
2. (Technical) Students will be able to critically reflect on a specialist body of knowledge related to their project work and the various facets and practical issues encountered.
3. (Teamwork) Students will be able to apply the elements of effective teamwork and articulate a team's strengths and weaknesses.
4. (Leadership) Students will be able to provide able and effective aid in leading a diverse team.
5. (Management) Students will be able to apply and critically evaluate their project and self-management skills in the context of a diverse engineering project team, and demonstrate an awareness of the principles and challenges of people/team management.
6. (Communications) Students will exhibit competence in oral and/or written communication in the context of the engineering project, to a variety of stakeholders, via presentation, written reports, and contribution to team and mentor meetings.
7. Students will be able to independently identify a gap in their own capability and how to fill this gap.

2.4 Relationship with the discipline and the rest of your program

The following table sets out how the learning outcomes of this course are connected to your program learning outcomes as articulated in the [Engineers Australia Stage 1 Competencies](#).

Course Learning Outcome (CLO)	LO Statement	EA Stage 1 Competencies	Related Tasks & Assessment
CLO 1	(Research/Enquiry) Students will be able to apply engineering and enquiry-based methods in the pursuit of solving a team-based multidisciplinary engineering problem.	PE1.5, 1.6, 2.1, 2.2, 2.3	Ideation and creativity workshop and Assessment 4
CLO 2	(Technical) Students will be able to critically reflect on a specialist body of knowledge related to their project work and the various facets and practical issues encountered.	PE1.5, 1.6, 2.1, 2.2, 2.3	Assessment 4
CLO 3	(Teamwork) Students will be able to apply the elements of effective teamwork and articulate a team's strengths and weaknesses.	PE3.6	Team skills workshops and Assessment 3, 4
CLO 4	(Leadership) Students will be able to provide able and effective aid in leading a diverse team.	PE3.6	Team skills workshops and Assessment 3, 4
CLO 5	(Management) Students will be able to apply and critically evaluate their project and self-management skills in the context of a diverse engineering project team, and demonstrate an awareness of the principles and challenges of people/team management.	PE2.4, 3.4, 3.5	LEAN canvas workshop, Assessment 3, 4.
CLO 6	(Communications) Students will exhibit competence in oral and/or written communication in the context of the engineering project, to a variety of stakeholders, via presentation, written reports, and contribution to team and mentor meetings.	PE3.2, 3.4	Fundamentals of communication workshops and Assessment 1, 2, 3, 4.
CLO 7	Students will be able to independently identify a gap in their own capability and how to fill this gap.	PE3.5	Assessment 2, 4

2.5 Course evaluation and development

We want your feedback on this course whether positive or negative. You can provide verbal or written feedback directly to your project coordinator, the course authority, through our course's anonymous feedback forum or through the University's myExperience survey.

3. Strategies and approaches to learning

Under the guidance of academics and industry mentors, this course (and the more senior versions) provides a vehicle for research- and project-driven group work. The structure of the course is largely team-based and assessments support and reflect this focus.

3.1 Learning and teaching activities

The main teaching strategy is weekly academic mentor meetings (similar to a thesis or academic consultation), however, there are a number of supporting (non-credit-based) classes and workshops provided for this course. Detailed and frequent email/Moodle use and use of Office 365 and guidance from academics provide the scaffold for the learning outcomes of the course. Depending on the nature of the project/research, industry and technical staff will also provide mentorship, in turn providing real world learning on projects and research.

At the end of the course, you will have the confidence to work in a team to deliver a shared project goal.

3.2 Expectations of students

Integrity and Respect

The UNSW Student Code of Conduct (<https://student.unsw.edu.au/conduct>) among other things, expects all students to demonstrate integrity in all the academic work and to treat all staff, students and visitors to the University with courtesy, tolerance and respect.

Time commitment

UNSW expects students to spend approximately 150 hours to successfully complete a 6 UOC course like ENGG2600. You will have 1 contact hour per week of team meetings. It is suggested to use up to 4 hours per week devoted to collaborative working time, professional development workshops, assessments, and working on your assigned deliverables.

Competence

Students are expected to enter ENGG3600 with a good understanding of the engineering design process and having developed competencies in all the material covered in the pre-requisite courses. You will be developing new competencies over the year and to demonstrate the standards we expect, there will be marking rubrics or guidelines provided for all assessments. You will be provided with feedback on your assessments from your team coordinators and peers so you can continue to improve over the year.

Participation

We expect you to actively participate in all face to face sessions. This includes listening, taking meeting notes, asking questions or engaging in peer discussions.

As part of the vision of the course, you will need to work effectively with your team members. We expect all team members to agree on how they will manage the team (e.g. making and documenting decisions), to assign the project work equitably and contribute to the delivery of project outputs to the best of their ability.

Students are expected to contribute to online discussions in the MS Teams communication channels. Communicating via MS Teams is especially important in the vertically integrated projects program as it can form part of the official record to document the research generated. You will likely need to

discuss parts of the design process, engineering challenges faced and task prioritisation here. It is expected that you will help others in your team and the project coordinators will contribute too.

Attendance and punctuality

We expect students to be punctual and attend at all meetings, workshops and organised team work sessions. University commitments take precedence over regular work activities, holidays etc. Students who attend less than 80% of their possible face to face sessions may be refused final assessment.

4. Course structure and schedule

This course consists of 1 hour of regular contact time and occasionally a 2-hour workshop as per the schedule. You are expected to take up to 4 hours of non-class contact hours to do your project work and complete assessments. Please note the schedule below may be updated with additional workshop sessions for term 2 and 3.

Time/ location	Activity/session	Related CLO
0 week Term 1	Welcome and info session (2 h) Welcome to the program and overview on the course structure and other info regarding VIP in 2020. There will be a morning team meeting after the welcome at around 10am. <ul style="list-style-type: none"> <i>Wed 12th Feb 2020, 9-11 am Columbo Theatre A</i> 	N/A
Week 2 Term 1	Ideation and creativity (2 h) Fundamentals of Design Thinking to create a team solution(s) to a key problem. A solution driven exercise in teamwork, creativity and approaching a common problem with a new entrepreneurial mindset. <ul style="list-style-type: none"> <i>Wed 26th Feb 2020, 9-11am TETB (Tyree Building) G15/16/17</i> 	1
Week 3 Term 1	LEAN canvas (2 h) Workshop including explanation and completion of LEAN methodology completion of a LEAN canvas with rapid research information supporting testing of assumptions. <ul style="list-style-type: none"> <i>Wed 4th Mar 2020, 9-11am TETB (Tyree Building) G15/16/17</i> 	5
Week 4 Term 1	Effective Teams (2 h) Equip students with and awareness of what teams are and what characteristics and behaviours make a team effective and successful. You will explore teams in various contexts through case studies in order to develop knowledge, skills and strategies to build your own effective team. There will be online pre-work released week 2, Term 1 that you will need to do before attending the session. <ul style="list-style-type: none"> Most VIP teams <i>Wed 11th Mar 2020, 9-11am TETB (Tyree Building) G15/16/17</i> Off world robotics <i>Tue 10th Mar 2020, 1.30-3.30 pm Matthews Building 312</i> Sunswift <i>Wed 11th Mar 2020 11am -1pm Matthews Building Room 103</i> 	3, 4

5. Assessment

5.1 Assessment tasks

Assessment 1: Communication (15%)

This assessment task will be in an oral and/or written format and agreed upon in consultation with your project coordinator based on how they would like to fulfil this communication assessment task. This assessment will require you to demonstrate competence in explaining in an audience appropriate format, multiple aspects of your project such as the project scope, challenges faced and broader implications of your research.

An example of what this assessment could entail, is included below. Ensure you talk to your project coordinator early about this assessment if they have not provided detail of what they expect you to do for this assessment:

Term 1 – Pitching (5%)

- Students give a 3-minute presentation to the project coordinator on the project scope and their progress to realising the deliverables.

Term 2 – Team poster/presentation (5%)

- Student VIP teams give a 10-minute presentation or a poster to the project coordinator of the project and their progress to realising their deliverables.

Term 3 – Pitch to public and industry leaders (5%)

- Students present their project as a poster at the inaugural Engineering Education festival which will be open to industry leaders, members of the public and high schools.

Assessment 2: Notebook (10%)

You will need to keep a detailed notebook of your work and submit these for review each term. A design notebook is important for documenting your project from the initial problem definition, right through to the product design. As you follow the design process, you will be adding to your notebook details for the steps you took to reach the final design including items such as your research, ideas, drawings and reflections.

A logically organised notebook is important for readability and it should allow for any other person to understand the steps and choices you made and repeat it for themselves if they ever needed to. Make sure you **document all your work** in your notebook as if it is not documented you have **no proof that you did it**. The documentation recorded in the notebook is vital for improving your thinking skills as an engineer, designing and managing realistic project plans, preparing patent applications, and providing you and others the ability to audit the designs you created.

Assessment 3 (15%): Self-Reflection and Peer Review

As part of your continuous development in every term you will do a self-reflection on how well you are working and a peer review of your fellow team members.

Part A – Self-reflection (5%)

The self-reflection task will involve four reflective questions as part of a strengths, weakness, opportunity, and threat (SWOT) analysis that will help you identify how well you are currently working

and the areas for where you can improve your workflow. For the four dimensions of the SWOT analysis you will need to consider how you are performing with respect to the deliverables that you have been assigned. Note that since this is a self-reflection, the core focus should be on how you are independently working although you may make broader reference to how you see yourself operating in the team in the opportunities and threats dimensions.

1. Strengths
2. Weaknesses
3. Opportunities
4. Threats

Part B – Team evaluation (10%)

The team evaluation will involve you evaluating each team member including yourself on a 5-point scale; extraordinary effort, above average effort, average effort, below average effort, well below average effort. Non-completion of the team evaluation for a term will result in a zero for that term. The score you receive will be based on your fellow team members feedback on the following four dimensions:

Communication

- You will need to rate your team members on their communication skills; including participation during meetings, listening to team members ideas, actively contributing to discussions, and timely responses to emails or other messages. If you believe each team member has performed equally in this aspect, then give everyone a rating of average effort.

Organisation

- Organisational skills and good time management are very important skills that can be brought to a team. You will need to rate your team members compared to others on the team. If you believe each team member has performed equally in this aspect, then give everyone a rating of average effort.

Completion of assigned responsibilities

- Accepting responsibility for allocated tasks and completing these assignments to a high standard and in a timely manner is very important for the functioning of a successful team. Rate your team members according to how reliable the team member has been in completing shared allocated tasks. If you believe each team member has performed equally in this aspect, then give everyone a rating of average effort.

Leadership qualities

- It is important for team members to develop and display good leadership skills. These might include effective decision making, an honest and ethical approach and their ability to inspire and motivate their teammates. Rate your team members according to their leadership abilities. If you believe each team member has performed equally in this aspect, then give everyone a rating of average effort.

Assessment 4: Technical (60%)

A key part of your learning in this course will be determined by the outputs of the project-based work that you will undertake with your teams. Over the duration of the year you will need to demonstrate the development of your technical skills. How well you have attained these technical skills will be evaluated in this assessment task. Your project coordinator will discuss with you at the start of the

year the deliverables that they would like you to focus on. Since the outputs of teams will differ markedly based on what work you will be doing, this assessment could be in forms such as a technical report, business case study, presentation to industry, code, verified test case, essay, etc.

Summary of the assessment tasks:

Task	Weight	Description
Assessment 1: Communication	15%	Students will present their project work as written and/or oral format as determined with their project coordinator. This assessment is linked to learning outcome 6.
Assessment 2: Notebook	10%	Students will regularly record their meetings, design work, graphs, drawings, etc. in their notebook to document their project management skills and improving their ability to work independently. This assessment is linked to learning outcomes 6 and 7.
Assessment 3 Part A: Self-reflection	5%	Students will complete a self-reflection in the form of a SWOT analysis in order to give self-feedback on how students can improve their work and is linked to helping you achieve learning outcomes 3-6. This assessment will be available on the Moodle page.
Assessment 3 Part B: Team evaluation	10%	Students will complete a team evaluation each term to understand how they are working with their peers. This assessment can also act as an impetus for reflecting on where students can improve their teamwork. This assessment is linked to learning outcomes 3-6. This assessment will be available on the Moodle page.
Assessment 4: Technical	60%	Students will complete their major deliverable/s for assessment. This assessment is linked to learning outcomes 1-7.

Further information

UNSW grading system: <https://student.unsw.edu.au/grades>

UNSW assessment policy: <https://student.unsw.edu.au/assessment>

5.2 Assessment criteria and standards

Assessment 1: Communication marking criteria

The marking rubric/guidelines for this component will be determined in consultation with your project coordinator.

Assessment 2: Notebook marking criteria (marked out of 100)

1. Project task management (20 marks)
 - Evidence of regular updates (10 marks)
 - Documentation of tasks completed over time and how tasks were prioritised to meet deadlines (10 marks).
2. Meeting notes (15 marks) – detailed meeting notes including sub-team meetings as appropriate.
3. Technical detail (30 marks)
 - Evidence of the technical details of the design process recorded using diagrams, graphs, code, blueprints, etc. (15 marks)
 - References and resources used fully cited (5 marks)
 - Team efforts clearly distinguished from individual contributions (10 marks)
4. Reflections (10 marks) – periodic reflections on directions, progress and outcomes of decisions.
5. Usability (25 marks)
 - Well organised work that is written in a professional tone (5 marks)
 - A complete resource with details recorded in enough detail and in an easy to follow manner (5 marks)
 - Future team members would be able to continue with the research (15 marks)

Assessment 3: Part A – Self-reflection marking criteria (marked out of 25)

You will be assessed on your ability to demonstrate considered reflection on your current progress and how you will improve in the future according to the rubric below:

Criterion	High performance (4-5 marks)	Satisfactory (2-3 marks)	Un-satisfactory (0-1 marks)
Strengths	Comprehensive detail into current strengths in self-progress to the intended deliverables.	Some detail of current strengths or strengths are somewhat unrealistic.	Strengths not clearly identified or wholly unrealistic/irrelevant.
Weaknesses	Comprehensive detail into current weakness in self-progress to the intended deliverables.	Some detail of current weakness or weaknesses are somewhat unrealistic.	Weaknesses not clearly identified or wholly unrealistic/irrelevant.
Opportunities	Well thought out detail about current opportunities for changing work practices to achieve	Comprehensive and realistic ideas for current opportunities for changing work practices to achieve	Lacking in a clear idea of opportunities for self-improvement or wholly unrealistic/irrelevant.

Criterion	High performance (4-5 marks)	Satisfactory (2-3 marks)	Un-satisfactory (0-1 marks)
	set individual and team deliverables. Elaborates on a realistic plan for achieving suggested changes.	individual and team deliverables. Unclear plan for what to improve.	
Threats	Well thought out detail about current threats to achieving set individual and team deliverables. Elaborates on a realistic plan for negating potential threats.	Comprehensive and realistic ideas for current threats to achieving individual and team deliverables. Unclear plan for what to do to negate potential threats.	Lacking clear ideas of threats to achieving deliverables or wholly unrealistic/irrelevant.
Writing	Work is free of grammatical, punctuation and spelling errors	Work has minor of grammatical, punctuation and/or spelling errors	Many grammatical, punctuation and/or spelling errors.

Assessment 3: Part B Team evaluation marking criteria

Grades for this evaluation will be calculated based on the normalised mark from the evaluations of you given by your peers. For more detail on the scoring algorithm visit:

<http://webpaproject.lboro.ac.uk/academic-guidance/a-worked-example-of-the-scoring-algorithm/>

Assessment 4: technical marking criteria

The marking rubric/guidelines for this component will be determined in consultation with your project coordinator.

5.3 Submission of assessment tasks

All written work will be submitted for assessment via Moodle unless otherwise specified. If you are unable to submit the work via Moodle, you should email the work to the project coordinator as soon as possible. The time the email is received will be considered the submission time. If the final is too big to email, you can share it via your UNSW OneDrive.

Some assessments will require you to complete the work online and it may be difficult for the course coordinator to intervene in the system after the due date. You should ensure that you are familiar with assessment systems well before the due date. If you do this, you will have time to get assistance before the assessment closes.

When you submit work through Moodle for assessment you are assumed to be assenting to the standard plagiarism declaration. A copy of the plagiarism declaration is available from this course's Moodle page. You should not include a plagiarism declaration with your submissions as it will lead to false positives in the plagiarism detection system.

Late penalty

Submissions received after the due date and time will be penalised at a rate of 10% per day or part thereof.

5.4 Feedback on assessment

Feedback on your progress is integral to the design process and will be provided throughout the course from your project coordinator/s and your team members. To ensure you receive the greatest benefit from this feedback it is important that you solicit feedback from others, including your peers, and that you act on the feedback regularly. The feedback you will receive includes, but is not limited to, weekly team meetings, peer feedback as part of your team evaluation, regular feedback on your thoughts recorded in your notebook, and feedback from your project coordinator for your communication and technical assessment.

6. Academic integrity, referencing and plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at <https://student.unsw.edu.au/referencing>

Your referencing should be complete, and consistent. Consult your supervisor on her or his preferred referencing style (and the reasons why it is preferred!)

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage¹. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and plagiarism can be located at:

- The *Current Students* site <https://student.unsw.edu.au/plagiarism>, and
- The *ELISE* training site <http://subjectguides.library.unsw.edu.au/elise>

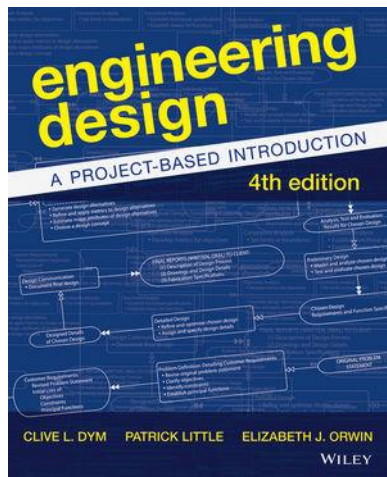
The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>.

7. Readings and resources

There are no set text books for this course. Any required readings/resources for the professional workshop series will be provided as you are doing them. Your team will also have shared resources that you are also responsible in contributing to.

It is recommended that you are familiar with the engineering design process that you studied as part of ENGG1000. The recommended text suggested by ENGG1000 for this is:

¹ International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.



Dym, Clive L., Engineering Design A Project Based Introduction.

8. Administrative matters

For enrolment and other administrative matters, please see the Engineering Student Support Services at The Nucleus: Student Hub. The office is on Level 2, Main Library, Kensington Campus and may be contacted on +61 2 9385 8100 or via <http://unsw.to/webforms>.

For course administration matters, please contact the Course Authority.

9. Additional support for students

- The Current Students Gateway: <https://student.unsw.edu.au/>
- Academic Skills and Support: <https://student.unsw.edu.au/academic-skills/>
- Student Wellbeing, Health and Safety: <https://student.unsw.edu.au/wellbeing/>
- Disability Support Services: <https://student.unsw.edu.au/disability-services/>
- UNSW IT Service Centre: <https://www.it.unsw.edu.au/students/index.html>