# DESN2000 T3, 2023

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| **Units of Credit** | **6** |
| Contact hours | 6 per week |

Design is one of the critical foundations of engineering and a main component in creating value. A good engineer has complex technical skills, but also creative skills, project management and teamworking skills, and knowledge of professional ethical standards in design.

DESN2000 aims to further develop your skills in engineering design with a particular focus on the early stages, where innovative concepts are created in response to open-ended problems. These skills will be developed in the context of an engineering project, with a focus on three areas: (1) research techniques needed to understand design problems and discover concepts, (2) technical skills needed to build a concept, and (3) evaluation methods for evaluating the concept. Alongside the development of design skills, the course also aims to develop your readiness for professional practice by deepening your understanding and skills in effective project management, teamwork and communication.

The course builds on the teamwork, communication, and project management skills introduced in ENGG1000/DESN1000. Skills learned in DESN2000 are further deepened in DESN3000, which will develop skills for managing design in commercial context.

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| **Faculty Coordinators** | Prof Ilpo Koskinen<br>Arianna Vignati<br>*Design Next, Kens J17 Lv5 Room 503*<br>*(direct all email to a.vignati@unsw.edu.au)* |
| **School Coordinator and Lecturer** | - A/Prof. Ang Liu (ang.liu@unsw.edu.au)<br>Room 408C, Ainsworth Building<br>- Dr. Hoang-Phuong Phan (hp.phan@unsw.edu.au)<br>Room 208D, Ainsworth Building<br>- Dr. Patrick Burr (p.burr@unsw.edu.au)<br>Room 402A, Ainsworth Building |
| **Demonstrators** | Shaun Wang (Head Demonstrator)<br>(shaun.wang@student.unsw.edu.au)<br>Harvey Ling (harvey.ling@student.unsw.edu.au)<br>Oliver Wan (o.wan@student.unsw.edu.au)<br>Maria Cuyutupa Garcia<br>(m.cuyutupagarcia@student.unsw.edu.au)<br>Isaac Seeto (isaac.seeto@student.unsw.edu.au) |

Julio Martins (julio.martins@student.unsw.edu.au)
Keagan Flynn (k.flynn@student.unsw.edu.au)
Dan Nguyen (d.h.nguyen@student.unsw.edu.au)
John Paulo Dimalanta Nalus (j.nalus@student.unsw.edu.au)
Siena Seeto (siena.seeto@student.unsw.edu.au)
Prasanna Rajouria (p.rajouria@student.unsw.edu.au)
Justin Chuwardi (j.chuwardi@student.unsw.edu.au)
Joseph Claudio Logozzo (j.logozzo@student.unsw.edu.au)
Aiden Casey (aiden.casey@unsw.edu.au)

**INFORMATION ABOUT THE COURSE**

**Prerequisites and assumed knowledge**

This is a 2nd year core course for all students following an Engineering undergraduate program. Prerequisites are as follows:

| School | Program | 1st prereq | 2nd prereq | 3rd prereq |
|---|---|---|---|---|
| MECH | AEROAH, MECHAH, MANFAH, MTRNAH | ENGG1000 or DESN1000 | MMAN1130 | |

Students are expected to take personal responsibility for ensuring they complete the correct stream.

**HANDBOOK DESCRIPTION**

See link to virtual handbook*:*

https://preview.handbook.unsw.edu.au/undergraduate/courses/2022/DESN2000/

This course will give students skills for creating innovative design concepts in the context of ……. project. Specifically, DESN2000 aims to further develop your skills in engineering design with a particular focus on the early stages, where innovative concepts are created in response to open-ended problems. These skills will be developed in the context of an engineering project, with a focus on three areas:

(1) research techniques needed to understand design problems and discover concepts,

(2) technical skills needed to build a concept, and

(3) methods for evaluating the concept.

Alongside the development of design skills, the course also aims to develop your readiness for professional practice by deepening your understanding and skills in effective project management, teamwork and communication.

This course combines generic design content with discipline-specific content. The common section focuses on mapping contextual information including human factors; analysis of the information; creative methods for translating the information into design concepts; communication of the information; and evaluation methods for analysing the validity of the design proposals.

The course also develops discipline-specific skills

**OBJECTIVES**

The course also develops discipline-specific skills. For students who major in mechanical engineering, mechatronic engineering, and aerospace engineering, this course focuses on the synthesis of two types of skills:

1. Conceptual Design

a. Understand how to formulate functional requirements and functional modelling.

b. Understand how to generate and evaluate design concepts.

c. Understand how to improve and optimize design concepts.

d. Understand team collaboration and project management.

2. Detailed Design and Component Design

a. Understand how to select the best material to fulfil functional requirements.

b. Understand the basics of power transmission and motor selection.

c. Understand different types and methods of fasteners.

d. Understand different types and applications of sensors.

The course instructor and demonstrators will be there to guide you but may not have all the answers you are looking for. Fortunately, nowadays information and specialised resources are only a few typed questions away. You are strongly encouraged to look for solutions beyond the confinements of the course. After all, this is a real world challenge and you are an engineer!

This term you will take your engineering skills one step further as you solve a real world challenge with the help of an even bigger and better team.

**TEACHING STRATEGIES**

The primary teaching vehicle of the course is an engineering project in which students learn to apply scientific, engineering, and user-centred knowledge to a design problem. Details of this project are provided in a separate *Project Brief*.

Students will complete both individual and group work. For each hour of contact it is expected that you will put in at least 1.5 hours of private study. It is expected that groups meet outside of the scheduled times and progress their group project independently.

**Communication**

This course uses both Moodle and Microsoft Teams as the portal for remote teaching and learning. It will be used for file sharing, virtual classrooms, announcements and other communications. You are expected to check the platforms regularly. In the first instance, you are encouraged to ask questions after lectures. Otherwise course discussions and questions take place on MS Teams. Your demonstrators and academic staff will actively monitor these posts. Please use replies and keep discussions in appropriate channels. If required, emails must be made from your student email address with DESN2000 in the subject line.

All class materials for 2021 T3 will be delivered online via MS Teams, with some aspects handled via Moodle. This includes the project brief, lecture notes, lab guides, workshop guides and assessment guides. You will be added to the DESN2000 Teams instance automatically. You'll find most documents in the following location:

**Team:** *DESN2000 <MECH> – 2023 T3* > **Channel:** *General* > **Tab:** *Files*

MS Teams may also be used for lecture recordings and virtual classrooms. Links are posted well in advance of scheduled times.

**Lectures**

You are expected to attend all lectures, which are all delivered F2F and recorded to be available on Moodle. These provide the backbone for your practical work in the workshops and your project.

**Workshops**

Twice-weekly workshops are the primary means through which students work through their project and associated exercises aimed at developing understanding of the course materials. Demonstrators are available to provide guidance and support teams in their project development. Guides for these classes will be made available in MS Teams.

Your class times may vary week to week. Please check your myUNSW timetable for your class times each week.

**EXPECTED LEARNING OUTCOMES**

*This course is designed to address the learning outcomes above and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.*

| Course Learning outcomes (CLO) | | |
|---|---|---|
| **#** | **Learning outcome description** | **EA stage 1 Competencies** |
| 1 | Develop design concepts using standard methods to collect, assess and integrate end user, stakeholder and project requirements. | 1.5, 2.1, 2.2, 2.3, 3.3 |
| 2 | Validate the suitability of designs using standard technical methods, while considering end-user and stakeholder contexts. | 1.5, 1.6, 2.1, 2.2, 2.3, 3.3 |
| 3 | Implement disciplinary technical theory and skills pertinent to the design project. | 1.3, 2.1, 2.2, 2.3 |
| 4 | Contribute to the work of a team and collaborate on the design project, including the implementation of organisational and interpersonal tools. | 2.4, 3.3, 3.4, 3.5, 3.6 |
| 5 | Integrate project management techniques to plan, execute and complete an open-ended design project. | 2.4, 3.4 |
| 6 | Explain designs to various audiences using oral, written, and visual forms of professional and persuasive communication. | 1.2 |

**COURSE PROGRAM**

## Class Topics and lecture schedule

*Please check your myUNSW timetable for specific workshop times.*

| Date | Design component | | Technical component | |
|---|---|---|---|---|
| | **Lectures** | **Workshops** | **Lectures** | **Workshops/labs** |
| **Week 1** | Introduction to concept design<br>1 hr<br>Ilpo Koskinen | Design Sprint | Introduction to design thinking and energy harvesting<br>2 hr + 1 hr<br>A/Prof. Ang Liu | Project introduction and team formation |
| **Week 2** | Research and analysis<br>1 hr<br>Arianna Vignati | Planning user research and analysis | Functional Requirement<br>2 hr + 1 hr<br>A/Prof. Ang Liu | Functional requirement |
| **Week 3** | Concept generation 1h<br>Arianna Vignati | Problem statement and concept generation | Axiomatic Design Theory<br>2 hr + 1 hr<br>A/Prof. Ang Liu | Axiomatic Design<br>Fasteners |
| **Week 4** | Prototyping and user testing 1h<br>Arianna Vignati | Planning user testing | Biologically inspired design<br>1 hr (public holiday on Monday)<br>A/Prof. Ang Liu | Interim design presentation |
| **Week 5** | Pitching 1h<br>Guest lecture | Storytelling by pitching | Material Selection<br>2 hr + 1 hr<br>Dr. Patrick Burr | Material selection |
| **Week 6** | *No new content or assignment submission during week 6 due to flexibility week.* | | | |
| **Week 7** | | | Sensor Selection<br>2hr + 1 hr<br>Dr. Hoang-Phuong Phan | Sensor selection |
| **Week 8** | | | TRIZ (Theory of Inventive Problem Solving)<br>2 hr + 1 hr<br>A/Prof. Ang Liu | TRIZ<br>Power transmission |
| **Week 9** | | | Project consultation (no new lecture)<br>2 hr + 1 hr<br>A/Prof. Ang Liu | Project consultation |

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| **Week 10** | | Design Presentation. Live Pitching Session | No lecture | Final design presentation |

**ASSESSMENTS**

**Assessment Outline**

| | Item | Weight | CLO | Assessment criteria | Due date |
|---|---|---|---|---|---|
| **Design 40%** | **Design Journal ( 👤 )** | 20% | 1-6 | Refer to assessment guide | 08:59 AM, MONDAY (Week 7) |
| | **Design presentation (pitch) ( 👥 )** | 20% | 1-6 | Refer to assessment guide | LIVE PRESENTATION (Week 10) |
| **Technical 60%** | **Interim Presentation:** Team **( 👥 )** and individual presentation **( 👤 )** | 20% | 1-6 | Refer to assessment guide | LIVE PRESENTATION (Week 4) |
| | **Final Design Report ( 👥 )** | 40% | 1-6 | Refer to assessment guide | 11:59 PM, Friday, November 24th (Week 11) |

( 👤 ) individual assessment. ( 👥 ) group assessment.

Details for each assessment are presented in separate assessment guides for each task. Individual contribution to group assessments will be evaluated via a team evaluation survey for each submission. Marks will be returned within 2 weeks of the submission due date.

**RELEVANT RESOURCES**

- van Roeijen, Annemiek et al. 2015. Delft Design Guide. BIS Publisher, Amsterdam. Second edition.
- Preece (2019), 5th ed., Interaction Design: Beyond Human-Computer Interaction. John Wiley & Sons
- Reinders, Angèle et al. 2012, *The Power of Design: Product Innovation in Sustainable Energy Technologies*, Chichester, West Sussex, U.K. : John Wiley & Sons.
- Siegel, Neil G. 2019, *Engineering project management,* Hoboken, NJ, USA, John Wiley and Sons, Incorporated.

**DATES TO NOTE**

Refer to MyUNSW for Important Dates available at: https://student.unsw.edu.au/dates

**ASSESSMENT SUBMISSION AND MARKING CRITERIA**

Refer to assessment guide.

## PENALTIES

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 5 percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

1. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
2. Online quizzes where answers are released to students on completion, or
3. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
4. Pass/Fail assessment tasks.

## EXAMINATIONS

There is no mid-term or final examination in this course.

## SPECIAL CONSIDERATION & SUPPLEMENTARY EXAMINATION

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

UNSW now has a Fit to Sit / Submit rule, which means that if you attempt an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

## ACADEMIC HONESTY AND PLAGIARISM

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: https://student.unsw.edu.au/plagiarism.

The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here: http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

## CLASS DESCRIPTION

This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.

## CREDIT POINTS

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

## GENERAL CONDUCT & 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.

## HEALTH, SAFETY & ON-CAMPUS CLASS ATTENDANCE

Due to the COVID-19 pandemic, circumstance may change very quickly. Please refer to your course's Microsoft Teams and Moodle sites for more up-to-date information about class attendance for in-person and online classes. Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by NSW health or government authorities. Current alerts and a list of hotspots can be found on NSW Health's website.

**You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed with the course coordinator. In certain classroom and laboratory situations where physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to: https://www.covid-19.unsw.edu.au/safe-return-campus-faqs

## 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 your student society 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 including updated lecture notes, workshops, blended learning resources, in-class demonstrations, and industry guest lectures.

## ADMINISTRATIVE MATTERS AND LINKS

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Moodle
- Faculty Transitional Arrangements for COVID-19
- UNSW Timetable
- UNSW Handbook
- Equitable Learning Services

## EQUITY AND DIVERSITY

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course,or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

## CRICOS

CRICOS Provider Code: 00098G 🦁

## ACKNOWLEGEMENT OF COUNTRY

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

## APPENDIX

### Appendix A: 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.

### Appendix B: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

| | **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 |