



Mechanical and Manufacturing Engineering

Course Outline

Term 2 2019

MECH4100

MECHANICAL DESIGN 2

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1. Staff contact details

Contact details and consultation times for course convenor

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Email: david.lyons@unsw.edu.au (email is the best way to contact me)

Course Moodle: <https://moodle.telt.unsw.edu.au/course/view.php?id=41764>

It is recommended you email the course convenor to make a specific appointment, *only after checking* if your concern cannot be appropriately addressed by one of the course demonstrators.

- Always consult the course Moodle first in case your questions have already been answered.
- Students should consult with their mentors directly during the allocated group sessions.
- Students can also approach the two Head Demonstrators.

Contact details and consultation times for additional lecturers/demonstrators/lab staff

Please see the course [Moodle](#) for demonstrator contact details.

2. Important links

- [Moodle](#)
- [Lab Access](#)
- [Computing Facilities](#)
- [Student Resources](#)
- [Course Outlines](#)
- [Engineering Student Support Services Centre](#)
- [Makerspace](#)
- [UNSW Timetable](#)
- [UNSW Handbook](#)
- [UNSW Mechanical and Manufacturing Engineering](#)

3. Course details

Credit points

This is a 6 unit-of-credit (UoC) course and involves up to 5 hours per week (h/w) of face-to-face contact.

The normal workload expectations of a student are approximately 25 hours per term for each

UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

You should aim to spend about 9 h/w on this course. The additional time should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

Contact hours

Please attend the Week 1 lecture in D23-201 Mathews Theatre A at 9am on Thursday 6 June 2019 where the following complex timetable details will be explained and discussed.

	Day	Time	Location	Week
Lectures/disciplinary information seminars	Thursday	9am – 11am (room avail til 12noon)	D23-201 Mathews Th A	Week 1 plus weeks 2,3,4 to be confirmed (Moodle)
Group meetings	Thursday	From 2pm, 3pm or 4pm (check your Group/Moodle)	Ainsworth J17 102 or 202 (check your Group/Moodle)	Weeks 1 to 10 Booking of space reserved for 1hr/Group
CAD lab booking for MECH4100	Thursday	From 1pm, 2pm or 3pm (check your Group/Moodle)	Ainsworth J17 203 or 204 (check your Group/Moodle)	Weeks 1 to 10: Booking of space reserved for 1hr/Group to use when needed
Group progress presentation	Thursday	9am to 12noon	Ainsworth J17 G02, 102, 202, CivEng H20 G1, 101 (check your Group/Moodle)	Week 5, 6 or 7 depending on your Group. Check Moodle.
Group final presentation	Thursday	9am to 12noon	Ainsworth J17 G02, 102, 202, CivEng H20 G1, 101 (check your Group/Moodle)	Week 10 (rooms also reserved for MECH4100 in weeks 8 & 9; use as needed for practice)

Please refer to your **Group's** timetable for the learning activities you are enrolled in and attend only those classes.

Summary and Aims of the course

This is the final undergraduate course (or Masters course) in engineering design. Here you will be expected to apply the knowledge and skills you acquired in the preceding

courses/degree to a real, commercial design problem. To facilitate this, you will be working on a team project specified by UNSW's **Industry Partners**.

The course requires the assembly of large amounts of high-level documentation and two instances of formal public presentation. The demonstration of team work and collaborative skills – as well as meeting specified deliverables – is essential for satisfactory completion. Interaction with the clients – both in formal meetings and in your regular liaison throughout the term – as well as the quality of your reporting of these events will be evaluated to the standards expected of professional consulting engineers.

You will nominate a preference for your project (and hence Industry Partner) during Week 0 (27-31 May 2019) on Moodle. Upon allocation to a Project (by the head demonstrator by Week 1), your Group of 10 members will engage in activities and negotiated learning with experts from both within and outside the university. Essentially, by the end of term your team must have:

- **Formulated the technical specifications for your design** through a process of negotiation with your Industry Partner, Group Mentor/tutor and academic staff. The design must be completed with a high level of engineering rigour.
- Understood and **demonstrated that you were responsible for defining and describing the organisational structure of your Group**, managing the project and coordinating the workload within your Group.

Student learning outcomes

This course is designed to address the learning outcomes below 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.

After successfully completing this course, you should be able to:

Learning Outcome		EA Stage 1 Competencies
1.	Implement the basic elements of managing a design project and be able to plan and schedule work activities in accordance with standard practice in a Group environment.	PE1.6, 2.1, 2.3, 2.4, 3.1, 3.4, 3.5, 3.6
2.	Apply an effective problem-solving approach that is deliverable in practice and justify and defend the selection.	PE1.1, 1.4, 1.6, 2.1, 2.2, 2.3, 3.3
3.	Appreciate the need to critically review and reflect on your own capability and to invite peer review; to benchmark your performance against appropriate standards and to determine areas for your further development.	PE1.6, 2.1, 2.3, 2.4, 3.5, 3.6
4.	Execute effective oral and written presentations to technical audiences.	PE 3.2, 3.4

4. Teaching strategies

Effective learning is supported when you are actively engaged in the learning process. You become more engaged when you can see the relevance of your studies to professional, disciplinary and/or personal contexts. In lectures and assignments, this relevance is best shown by way of examples drawn from industry. The final year of your degree/Master's program is an ideal opportunity to experience "real world" engineering problems through interaction with industry and to gauge your strengths and weaknesses against their expectations and standards.

In industry, you seldom choose your workmates, and the same applies to this course. For the work in this course, everyone will be assigned to a Group for the duration of the term, although your personal preferences *may* be taken into account, but not guaranteed. Most of the activities and assessments will be conducted through the group, although individual performance will be monitored and assessed – just as it would be in industry. Dialogue is encouraged between you, others in the class and the staff. Diversity in experience is acknowledged, as some students in each Group have prior industry background. You may draw on your experience to illustrate various aspects of the work you undertake, and this should help to motivate and facilitate engagement with the other members of your Group.

Technical, professional and personal knowledge and skills are best acquired through a combination of conceptual support, experience, reflection and then planning for the next exercise. This course provides a range of learning strategies and activities to support this approach. The electronic **Learning Management System** (LMS) – Moodle - is provided to foster an environment where you can collaborate in discussion groups and acquire the necessary information to complete your assignments through interaction with lecturers, mentors and your peers: <http://moodle.telt.unsw.edu.au>.

This course attempts to approximate the learning processes that you will encounter upon entering industry. As such, the course will be highly activity-based. The material presented in **lectures/seminars** in Weeks 1 to 4 will be limited to the material necessary to engage in the assessable learning activities:

- A large part of engineering design involves the effective communication of your ideas and the confident justification of your approach. To do this well you need to be able to draft clear and concise reports and engineering drawings which are stand-alone documents. However almost invariably as a designer, you will at some point in the tendering process have to give an oral defence for your design. This is the focus of the **mentoring** and **progress/final review** activities.
- Your work in a **major design project** where you can practise your design skills and demonstrate your understanding of the fundamental concepts of design, teamwork and project management. Study of the diverse disciplines of engineering has occupied much of your time in previous years. You were mostly assessed only in one of those sub-disciplines at a time. Yet to create a tangible artefact that is complex (such as an aircraft), knowledge and skills from many diverse engineering disciplines will be needed by the designers to make the design successful. This is the focus of your industry-based project.

5. Course schedule

	Week
Lectures/disciplinary information seminars	Week 1 plus weeks 2,3,4 to be confirmed (see Moodle)
Group meetings	Weeks 1 to 10 Booking of space reserved for 1hr/Group (see Moodle and p3 Contact Hours)
CAD lab booking for MECH4100	Weeks 1 to 10: Booking of space reserved for 1hr/Group to use when needed (see Moodle and p3 Contact Hours)
Group progress review/ presentation	Week 5, 6 or 7 depending on your Group. Check Moodle.
Group final presentation /poster/report	Week 10 (rooms also reserved for MECH4100 in weeks 8 & 9; use as needed for practice)

6. Assessment

Assessment overview

Task	Length	Group/ Individual	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
T1: Industry Partner preference (not guaranteed)	N/A	Individual	N/A	N/A	N/A	Week 0 (27-31 May) via Moodle Poll	N/A	N/A
T2: Group meetings	N/A	Group	N/A	1 and 4	N/A	N/A	N/A	N/A
T3: Progress Review	<=10 minutes per presentation	Group	20%	2 and 4	Design capability and oral presentation skills	Week 4	N/A	1 week via Moodle
T4: Poster Presentation	Up to 3 hours	Group	20%	2 and 4	Design capability and oral presentation skills	Weeks 10	N/A	2 weeks via Moodle
T5: Final Design Report	30 page as guide + appendices	Group	30%	1 and 2	Design capability and report writing skills	Week 10	N/A	Upon release of final results
T6/T7: Feedback from Client and Mentors	N/A	Group	30%	3 and 4	Design capability and communication skills	Weeks 5/6/7 & 10	N/A	Upon release of final results
T8: Peer Assessment	N/A	Individual	N/A	1, 2 3 and 4	As above	Week 10	N/A	Feedback via Moodle, actual marks upon release of final results

Assignments

The assessment tasks for this course are described below:

T1 Project Preference and Placement in Group

In Week 0 (27-31 May), details of projects will be posted on Moodle. After review, place your preference in the Moodle poll. Your preference is not guaranteed but will be accounted for as much as possible.

T2 Group Meetings

Group Meetings will commence in Week 1.

T3 Progress Review

The Progress Review is an opportunity for you to improve your oral communication skills through a focus on public speaking and persuasion. This activity requires your Group to explain how the work is progressing, what the significant issues are for the design projects. Assessment will focus on the clarity, audibility, content knowledge and persuasiveness of your oral defense as judged by both your Mentors/tutors.

T4 Poster Presentation

This is where you will present your work to your industrial partners through a Poster Presentation Event. Your mark for this particular assessment will be determined by the mentors, course staff and industrial partner.

T5 Final Report

The report will be in the form of a Group-submission professional engineering document. In this document, you will detail the brief you were given at the start of the project. You will then show how you worked from an initial statement of the problem, following a sound process to develop a design to satisfy your industrial partner's needs.

The report will include all of the information required for the client to implement the design. If drawings are included, they will be to AS 1100. The particular challenge of this report will be to adequately convey the information within the prescribed length limit.

T6 Feedback from Client

Your Industry Partner may comment on your performance. Your Group's overall performance will be considered with regard to how well you addressed the client's needs, the rigour of your approach to solving their problem and ultimately the usefulness to them of your work.

T7 Feedback from Mentor

Your mentors will comment on your performance. Your Group's overall performance will be assessed with regards to the professionalism, communication, time-management and record keeping ability that your team has demonstrated throughout the course.

T8 Peer Assessment

To ensure that all students participate equitably in Group assessments, there will be a Peer Review process whereby each student will be evaluated by every member of their team. The results of this Peer Review can affect your final mark. Details of this process will be made available on *Moodle*.

Presentation

All electronic submissions must have a standard School cover sheet which is available from this course's Moodle page.

All submissions shall be in electronic format (with the exception of task T4 - Poster) and are expected to be typed, neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Submission

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 per cent (20%) 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:

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

Marking

Marking guidelines for assignment submissions may be provided on Moodle at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to marking guidelines provided.

Examinations

There is no examination for this course.

Special consideration and supplementary assessment

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.

Please note that UNSW now has a [Fit to Sit / Submit rule](#), which means that if you sit 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](#).

7. Expected resources for students

Learning Management System

Moodle, the electronic Learning Management System (LMS) will be your main source of day-to-day information regarding administration of this course: <https://moodle.telt.unsw.edu.au>. Moodle will be used to distribute information relevant to the course and will also be used as a portal for online discussions both within your Group. Moodle should be checked at least weekly (preferably daily) throughout the duration of this course.

Client Meetings

Wisdom is gained most effectively by attempting to avoid the (often painful) mistakes of those who have come before you. Your client will be able to assist you – within reason – by providing you with the advice, feedback and encouragement so that you may perform effectively as an engineering designer. Make full use of these experienced people, but do so in a professional manner. Your clients are busy people – like yourselves – often with the added responsibility of having multi-million dollar budgets to juggle. Please make specific arrangements *only through your Mentor/tutor* if contact is required outside of the allocated meeting times for your Group.

Suggested Reading

Whilst there is not a prescribed textbook for this course, you may find the following materials instructive:

- Dym, C.L and Little, P. (2009). Engineering Design: A Project-Based Introduction.
- Robert B. Cialdini (1993). Influence: The Psychology of Persuasion.
- Carmen Simon (2016). Impossible to Ignore: Creating Memorable Content to Influence Decisions: Creating Memorable Content to Influence Decisions.
- Robert B. Cialdini (2017). Pre-Suasion : A Revolutionary Way to Influence and Persuade.

There are numerous valuable resources available on the web and additional sources will be provided in lectures and group sessions.

UNSW Library website: <https://www.library.unsw.edu.au/>

Moodle: <https://moodle.telt.unsw.edu.au/login/index.php>

8. Course evaluation and development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, recent improvements resulting from student feedback include the broadening of the range of Industry Partners and projects available. Reflective writing assignments have been removed. The group size (number of students per group) has been increased to reduce individual student workload.

9. 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: 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:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

10. Administrative matters and links

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

- [Attendance](#)
- [UNSW Email Address](#)
- [Computing Facilities](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)
- [Student Equity and Disabilities Unit](#)
- [Health and Safety](#)
- [Lab Access](#)

*David Lyons
Chartered Engineer
Course Convenor
24 May 2019
Rev 03*

Appendix A: 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