



Mechanical and Manufacturing Engineering

Course Outline

Semester 2 2018

MECH4100

MECHANICAL DESIGN 2

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1. Staff contact details

Contact details of the course convenor

Mr. David Lyons CEng GCULT FRINA MIEAust

Office location: Ainsworth J17 208D

Tel: (02) 9385 6120

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

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 head demonstrator.

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

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

2. Important links

- [Moodle](#)
- [UNSW Mechanical and Manufacturing Engineering](#)
- [Course Outlines](#)
- [Student intranet](#)
- [UNSW Mechanical and Manufacturing Engineering Facebook](#)
- [UNSW Handbook](#)

3. Course details

Credit Points

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

The UNSW website states “The normal workload expectations of a student are approximately 25 hours per semester for each UoC, including class contact hours, other learning activities, preparation and time spent on all assessable work. Thus, for a full-time enrolled student, the normal workload, averaged across the 16 weeks of teaching, study and examination periods, is about 37.5 hours per week.”

This means that 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 first lecture in J17 G03 at 9am on Wednesday 25 July where the following complex timetable details will be explained and discussed.

The timetabling for this course is complex, derived from a program of lectures, seminars and tutorials. Please refer to <http://timetable.unsw.edu.au/2018/MECH4100.html#S2> for details.

A summary appears below:

| | Day | Time | Location | Week |
|------------------|--|--------------|--|-----------------------------------|
| Lectures | Wednesday | 9am – 12noon | J17 G03 | Week 1,3,4,5,6,10 |
| Seminars | Wednesday | 9am – 12noon | J17 G02 or 102 or 202 or H20 G1. Go to your timetabled group location only | Weeks 2,11,12 |
| | Wednesday | 9am – 12noon | J17 G02 or G03 or 102 or 202. Go to your timetabled group location only | Weeks 7, 8, 9 |
| Tutorials | Wednesday (Groups: Purple, Blue, Green, Orange) | 1pm – 2pm | J17 G01 or 101 or 203 or 204. Go to your timetabled group location only | Weeks 3,4,5,6,7,8,9,10,11,12,(13) |
| | Wednesday (Groups: Purple, Blue, Green, Orange) | 2pm – 3pm | J17 G01 or 101 or 203 or 204. Go to your timetabled group location only | Weeks 3,4,5,6,7,8,9,10,11,12,(13) |
| | Thursday (Group: Red) | 12noon – 1pm | J17 204. Go to your timetabled group location only | Weeks 3,4,5,6,7,8,9,10,11,12,(13) |
| | Thursday (Group: Red) | 1pm – 2pm | J17 G01. Go to your timetabled group location only | Weeks 3,4,5,6,7,8,9,10,11,12,(13) |

Please refer to your class 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 in mechanical engineering design. Here you will be expected to apply the knowledge and skills you acquired in the preceding courses 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 several 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 semester – 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) at the end of Week 2. Upon allocation to a Project (by the head demonstrator in Week 2), you will engage in activities and negotiated learning with experts from both within and outside the university. Essentially, by the end of semester your team must have:

- **Formulated the technical specifications for your design** through a process of negotiation with your Industry Partner and academic staff. The design must be completed with a high level of engineering rigour.
- Understood and **demonstrated that your team was responsible for constructing the organisational design of your team**, managing the project and coordinating the workload within your team.

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. | 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 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 team for the duration of the semester. Most of the activities and assessments will be conducted through the team, 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 class 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 team.

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** 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 review** activities.
- A series of Master Classes and FEA/CFD Consultation Sessions will be provided in the School's computer **laboratories** that align to the technical needs of the design problems provided by industry. Students will be expected to determine which of these are relevant to their projects and organise themselves to obtain the necessary information or help.
- 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 science has occupied much of your time in previous years. You were mostly assessed only in one of those sciences 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 | Activity | Task Due |
|------|---|----------|
| 01 | Lecture 1: Introduction and Problem Definition | |
| 02 | Project Introductions in 4 x Seminar groups | T1 |
| 03 | Lecture 3: Meeting Etiquette | |
| | 5 x Tutorial groups - Client Meetings | T2 |
| 04 | Lecture 4: Introduction to Product Development Part 1 | |
| | 5 x Tutorial groups - Mentor Sessions | |
| 05 | Lecture 5: Introduction to Product Development Part 2 | |
| | 5 x Tutorial groups - Mentor Sessions | |
| 06 | Lecture 6: Technical Presentation | |
| | 5 x Tutorial groups - Mentor Sessions | |
| 07 | 4 x Seminar groups - Progress Review | T3 |
| | 5 x Tutorial groups - Mentor Sessions | |
| 08 | 4 x Seminar groups - Progress Review | T3 |
| | 5 x Tutorial groups - Mentor Sessions | |
| 09 | 4 x Seminar groups - Progress Review | T3 |
| | 5 x Tutorial groups - Mentor Sessions | |
| MSB | Mid-semester Break | - |

| | | |
|----|--|----|
| 10 | Lecture 7: Predictive Maintenance and Machine Learning | |
| | | |
| | 5 x Tutorial groups - Mentor Sessions | |
| | | |
| 11 | Final Poster Sessions | T4 |
| | 4 x Seminar groups | |
| | 5 x Tutorial groups | |
| | | |
| | | |
| 12 | Final Poster Sessions | T4 |
| | 4 x Seminar groups | |
| | 5 x Tutorial groups | |
| | | |
| | | |
| 13 | Final Design Report | T5 |
| | Feedback from Client | T6 |
| | Feedback from Mentor | T7 |
| | Peer Assessment | T8 |

For some assessment tasks, you will split into groups and be required to attend different rooms. See **3. Course details - Contact hours**.

6. Assessment

Assessment overview

| Task | Length | Weight | Learning outcomes assessed | Assessment criteria | Due date and submission requirements | Deadline for absolute fail | Marks returned |
|---|-------------------------------|--------|----------------------------|--|--------------------------------------|----------------------------|---|
| T1: Project selection | N/A | N/A | N/A | N/A | Fri week 2 at 23.59 via Moodle | N/A | N/A |
| T2: Client meetings | N/A | N/A | 1 and 4 | N/A | N/A | N/A | N/A |
| T3: Progress Review | 30 minutes per presentation | 20% | 2 and 4 | Design capability and oral presentation skills | Weeks 7, 8 and 9 | N/A | Week 10, via Moodle |
| T4: Poster Presentation | 3 hours per session | 20% | 2 and 4 | Design capability and oral presentation skills | Weeks 11 and 12 | N/A | Week 13, via Moodle |
| T5: Final Design Report | 30 page as guide + appendices | 30% | 1 and 2 | Design capability and report writing skills | Week 12 | N/A | Upon release of final results |
| T6/T7: Feedback from Client and Mentors | N/A | 30% | 3 and 4 | Design capability and communication skills | Week 13 | N/A | Upon release of final results |
| T8: Peer Assessment | N/A | N/A | 1, 2 3 and 4 | All of above | Week 12 | N/A | Feedback via Moodle, actual marks upon release of final results |

Assignments

The assessment tasks for this course are described below:

T1 Project Selection and Placement

In Week 2, the Industrial Partners will present the Projects they have on offer through a Poster Presentation Event. You will then express a preference for which Project you'd like to work on.

T2 Client Interview

Having been placed in a Project Team, you must then formally meet with your Industry Partner some time in Week 3. Whilst there are no marks awarded for your participation *per se*, your professional conduct at this meeting will be noted and will contribute toward your score in T6.

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 team 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 and course staff.

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 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 will comment on your performance. Your team'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 team'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 team 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 will be provided on Moodle at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Examinations

There is no examination for this course.

Special consideration and supplementary assessment

For details of applying for special consideration and conditions for the award of supplementary assessment, 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 team, and perhaps between your team and your Industry Partner. *Moodle* should be checked at least weekly (preferably more frequently) 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 with them if contact is required outside of the allocated meeting times for your team.

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: 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

Further information on School policy and procedures in the event of plagiarism is available on the [intranet](#).

10. Administrative matters and links

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

- [Attendance, Participation and Class Etiquette](#)
- [UNSW Email Address](#)
- [Computing Facilities](#)
- [Assessment Matters](#) (including guidelines for assignments, exams and special consideration)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)
- [Student Equity and Disabilities Unit](#)
- [Health and Safety](#)
- [Student Support Services](#)

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 |