



Mechanical and Manufacturing Engineering

Course Outline

Semester 2 2017

MECH4100

MECHANICAL DESIGN 2

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1. Staff contact details

Contact details and consultation times for course convenor

Course convenor	Name: Dr Shaun Chan Office location: J17 Room 402D Email: ging.chan@unsw.edu.au Research: https://research.unsw.edu.au/projects/advanced-combustion-diagnostics-laboratory
Head demonstrator	Name: Cheng Wang Email: unsw.mechdesign2@gmail.com .

Students should consult with their mentors directly during the allocated group sessions or through the Moodle forum. Students can also approach the head demonstrator via email: unsw.mechdesign2@gmail.com.

Administrative enquiries that are personal and confidential in respect of an individual student can be made to the course convenor (Dr Shaun Chan), if the circumstances require it.

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

Please see the course [Moodle](#).

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 ~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 and further reading.

There is no parallel teaching in this course.

Contact hours

Refer to Section 4 and Course schedule for the day, time and location for each lecture, problem solving session, workshop, etc.

Summary and Aims of the course

This is the final 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 of 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 session – 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 main 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 the Industry Partner and academic staff. The design must be completed with a high level of engineering rigour.
- Understood and **demonstrated that they were responsible for constructing the organisational design of their team**, managing the project and coordinating the workload within their 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 Session. 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 of experiences 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. Almost invariably though you will, as a designer, 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 the industry-based project.

5. Course schedule

Week	Day	Date	Time	Activity	Location	Task Due
01	Thurs	27-Jul-17	12-15	Lecture 1: Introduction Lecture 2: Problem Definition	Law Theatre G04 (K-F8-G04)	
	Thurs					
	Thurs		16-18	No tute		
	Thurs					
02	Thurs	03-Aug-17	12-15	Project Introductions: Poster session	Design Studio (K-J17-Level 5)	
	Thurs					
	Thurs		16-18	No tute		T1
	Thurs					
03	Thurs	10-Aug-17	12-15	Lecture 3: Meeting Etiquette	Law Theatre G04 (K-F8-G04)	
	Thurs					
	Thurs		16-18	(Client Meetings)	Teams to discuss with clients	T2
	Thurs					
04	Thurs	17-Aug-17	12-15	Lecture 4: Introduction to Product Development Part 1	Law Theatre G04 (K-F8-G04)	
	Thurs					
	Thurs		16-18	Mentor Session	Ainsworth 203/204 (K-J17-203/204) Ainsworth G01/101 (K-J17-G01/101)	
	Thurs					
05	Thurs	24-Aug-17	12-15	Lecture 5: Introduction to Product Development Part 2	Law Theatre G04 (K-F8-G04)	
	Thurs					
	Thurs		16-18	Mentor Session	Ainsworth 203/204 (K-J17-203/204) Ainsworth G01/101 (K-J17-G01/101)	
	Thurs					
06	Thurs	31-Aug-17	12-15	Lecture 6: Technical Presentation	Law Theatre G04 (K-F8-G04)	
	Thurs					
	Thurs		16-18	Mentor Session	Ainsworth 203/204 (K-J17-203/204) Ainsworth G01/101 (K-J17-G01/101)	
	Thurs					
07	Thurs	07-Sep-17	12-15	Progress Review	Law Theatre G04 (K-F8-G04) Ainsworth 102 (K-J17-102) Ainsworth 202 (K-J17-202)	T3
	Thurs					
	Thurs		16-18	LEAP/Mentor Session	Ainsworth 203/204 (K-J17-203/204) Ainsworth G01/101 (K-J17-G01/101)	
	Thurs					

Week	Day	Date	Time	Activity	Location	Task Due
08	Thurs	14-Sep-17	12-15	Progress Review	Law Theatre G04 (K-F8-G04)	T3
	Thurs				Ainsworth 102 (K-J17-102)	
	Thurs	16-18	LEAP/Mentor Session	Ainsworth 202 (K-J17-202)		
	Thurs			Ainsworth 203/204 (K-J17-203/204)		
	Thurs			Ainsworth G01/101 (K-J17-G01/101)		
09	Thurs	21-Sep-17	12-15	Progress Review	Law Theatre G04 (K-F8-G04)	T3
	Thurs				Ainsworth 102 (K-J17-102)	
	Thurs	16-18	LEAP/Mentor Session	Ainsworth 202 (K-J17-202)		
	Thurs			Ainsworth 203/204 (K-J17-203/204)		
	Thurs			Ainsworth G01/101 (K-J17-G01/101)		
Break			-	-		-
			-	-		-
			-	-		-
			-	-		-
			-	-		-
10	Thurs	05-Oct-17	12-15	Lecture 7: Predictive Maintenance and Machine Learning	Law Theatre G04 (K-F8-G04)	
	Thurs					
	Thurs	16-18	Mentor Session	Ainsworth 203/204 (K-J17-203/204)		
	Thurs			Ainsworth G01/101 (K-J17-G01/101)		
11	Thurs	12-Oct-17	12-15	Final Poster Session	Ainsworth G01 (K-J17-G01)	T4
	Thurs				Ainsworth 101 (K-J17-101)	
	Thurs	16-18	Room booked but no mentor	Ainsworth 201 (K-J17-201)		
	Thurs			Ainsworth 203/204 (K-J17-203/204)		
	Thurs			Ainsworth G01/101 (K-J17-G01/101)		
12	Thurs	19-Oct-17	12-15	Final Poster Session	Design Studio (K-J17-Level 5)	T4
	Thurs					
	Thurs	16-18	Room booked but no mentor			
	Thurs			Ainsworth 203/204 (K-J17-203/204)		
	Thurs			Ainsworth G01/101 (K-J17-G01/101)		
				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. Details will be posted on Moodle prior to the assessments.

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	23.59, Saturday 5 th August via Moodle	N/A	Week 3
T2: Client meeting	N/A	N/A	N/A	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 pages	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	-50%	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. Preference will be given to students with higher WAM.

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 will determine your final mark. Details of this process will be made available on *Moodle*.

Presentation

All non-electric submissions should have a standard School cover sheet which is available from this course's Moodle page.

All submissions are expected to be 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

Late submissions will be penalised 5 marks per calendar day (including weekends). An extension may only be granted in exceptional circumstances. Special consideration for assessment tasks must be processed through student.unsw.edu.au/special-consideration.

It is always worth submitting late assessment tasks when possible. Completion of the work, even late, may be taken into account in cases of special consideration.

Where there is no special consideration granted, the 'deadline for absolute fail' in the table above indicates the time after which a submitted assignment will not be marked, and will achieve a score of zero for the purpose of determining overall grade in the course.

Marking

Marking guidelines for assignment submissions will be provided 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 [School intranet](#), and the information on UNSW's [Special Consideration page](#).

7. Attendance

You are required to attend a minimum of 80% of all classes, including lectures, labs and seminars. It is possible to fail the course if your total absences equal to more than 20% of the required attendance. Please see the [School intranet](#) and the [UNSW attendance page](#) for more information.

8. Expected resources for students

Learning Management System

The electronic Learning Management System (LMS) will be your main source of day-to-day information regarding administration of the 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 frequently throughout the duration of this course.

Computer Laboratories / Consultation Rooms

Computer Laboratories (J17-203 and J17-204) and Consultation Rooms (J17-G01 and J17-101) have been booked for MECH4100 between 16:00 and 18:00 on Thursdays between Weeks 3 and 13 (inclusive).

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>

9. 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 LEAP sessions has also been postponed to give students more time to give further thoughts about their projects. The group size (number of students per group) has been increased to reduce students' workload.

10. 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](#).

11. 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)
- [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