



Mechanical and Manufacturing Engineering

# Course Outline

Term 1 2020

**MECH3110**

**MECHANICAL DESIGN 1**

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# 1. Staff contact details

## Contact details and consultation times for course convenor

Name: Dr Kana Kanapathipillai

Office location: J17/AW408J

Tel: (02) 9385 4251

Email: [s.kanapathipillai@unsw.edu.au](mailto:s.kanapathipillai@unsw.edu.au)

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

Generally, problem-solving class time should be used for direct consultation. Following problem-solving class if you need further consultation, then you may use phone or email for making an appointment for further consultation.

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

Name: Mr Garen Douzian (Head Demonstrator)

Email: [g.douzian@unsw.edu.au](mailto:g.douzian@unsw.edu.au)

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

# 2. Important links

- [Moodle](#)
- [Lab Access](#)
- [Health and Safety](#)
- [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 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 10 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

	Day	Time	Location
<b>Lectures</b>	Tuesday	5pm - 6pm	Ritchie Theatre
	Thursday	1pm - 2pm	ChemSc M17
(Web stream)	Any	Any	Moodle
<b>Demonstrations</b>	Tuesday	12pm – 2pm	Ainsworth 101/EEG09
	Tuesday	2pm – 4pm	Ainsworth 101/EEG09
	Wednesday	9am – 11am	Ainsworth 201
<b>Lab</b>	Thursday	2pm – 3pm	Ainsworth 203/204
	Thursday	3pm – 4pm	Ainsworth 203/204
	Thursday	4pm – 5pm	Ainsworth 203

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 course will continue the development of a systematic approach to problem-solving and design that commenced in earlier courses. It will focus on mathematical modelling for design applications; force flow through components and assemblies; rolling element bearing selection; dynamically loaded bolted connections; welded-joint design; shaft and gear design and explore these ideas in terms of practical applications.

The course follows on from the introduction provided by ENGG1000, extends the machine element design approach introduced in MMAN2100 and provides an opportunity to apply the mechanical knowledge and techniques gained from MMAN2400/ENGG2400. You will interact as part of a design team, while developing design solutions for a realistic problem of reasonable size and complexity. The lecture topics relate closely to assignment requirements with a balance between theory and practice. Assessment will have a strong emphasis on practical design knowledge and skills as well as a high standard of professional written and graphical communication. This will include researching information for design assignments and searching for solutions as task specifications become less complete and more realistic.

### 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.	Demonstrate the ability to utilise the process of engineering design and appropriate design methods generating alternative conceptual solutions, evaluating these solutions and implementing them to solve an open-ended design problem.	PE 1.1, 1.2,1.5, 2.1, 2.3, 2.3, 2.4
2.	Demonstrate the ability to manage a design project and be able to plan, schedule and document work activities in accordance with standard practice.	PE 1.3, 1.6, 2.1, 2.3, 2.4, 3.2, 3.3, 3.6
3.	Assess the safety of engineering structure and components in a machine system encountered in industry.	PE 1.3, 1.4, 2.2, 2.3, 2.4, 3.3, 3.4, 3.5
4.	Clearly and coherently communicate your design decisions in an engineering design report to a standard approaching that expected of industry.	PE 1.6, 3.1, 3.2, 3.4

## 4. Teaching strategies

This course attempts to approximate a typical design workplace environment in which accurate and professional quality results are required against cost and time constraints, information is incomplete or conflicting and team interaction is essential.

Lectures in this course are designed to cover the terminology, core concepts and techniques in the design of machines. They show how the various techniques are applied in practice and the details of when, where, and how they should be applied.

Problem-solving guidance sessions are designed to provide feedback and discussion on the project and to investigate problem areas in depth. Problem-solving guidance will assist you to develop the capacity to make judgements based on sound engineering practice and solid theory. You will be expected to seek out necessary information or ask for help.

## 5. Course schedule

Week	Topic	Location	Suggested Readings
1	Introduction to Course	Ritchie Theatre	Lecture notes, Moodle
	Engineering Specification	ChemSc M17	Lecture notes, Moodle
2	Design loads	Ritchie Theatre	Lecture notes, Moodle
	Structures	ChemSc M17	Lecture notes, Moodle
3	Welded Joints 1	Ritchie Theatre	Lecture notes, Moodle & Textbook
	Welded Joints 2	ChemSc M17	Lecture notes, Moodle & Textbook
4	Welded Joints 3	Ritchie Theatre	Lecture notes, Moodle & Textbook
	Bolted Joints 1	ChemSc M17	Lecture notes, Moodle & Textbook

Week	Topic	Location	Suggested Readings
5	No Lecture		
	No Lecture		
6	Bolted Joints 2	Ritchie Theatre	Lecture notes, Moodle & Textbook
	Bearings 1	ChemSc M17	Lecture notes, Moodle & Textbook
7	Bearings 2	Ritchie Theatre	Lecture notes, Moodle & Textbook
	Guest Lecture	ChemSc M17	Lecture notes, Moodle
8	Shafts 1	Ritchie Theatre	Lecture notes, Moodle & Textbook
	Shafts 2	ChemSc M17	Lecture notes, Moodle & Textbook
9	Shafts 3	Ritchie Theatre	Lecture notes, Moodle & Textbook
	Gears 1	ChemSc M17	Lecture notes, Moodle & Textbook
10	Gears 2	Ritchie Theatre	Lecture notes, Moodle & Textbook
	Fatigue Analysis	ChemSc M17	Lecture notes, Moodle & Textbook

Problem-solving sessions (PSS) will be conducted on Tuesdays between 12 pm – 2 pm or 2 pm – 4 pm in Ainsworth 101/EEG09 or on Wednesdays between 9 am – 11 am in Ainsworth 201, based on your enrolment. One-hour CAD lab classes will run on Thursdays in Ainsworth 203/204 between 2 pm – 5 pm as per your timetable. Both PSS and the CAD lab classes will commence in Week 1 and be continued till Week 10. Project information including the design brief will be available on Moodle.

## 6. Assessment

### Assessment overview

Assessment	Group Project? (# Students per group)	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Client Negotiations and report	Yes (6)	~ 500 words	10%	1 to 4	Interpretation and analysis of client requirements, formulation of competitive design for tender under simulated conditions.	Client negotiation: Week 3 during PSS Report: Midnight, Friday 13 <sup>th</sup> March via Moodle	Week 5	Within one week after submission
Design Pitch	Yes (6)/No	Not applicable	20%	1 to 4	Presentation skills, design familiarity and explanation in professional setting.	During week 7- 8 during PSS	N/A	Within two weeks after the presentation
Prototype Testing	Yes (6)/No	Not applicable	30%	1 to 4	Practical, hands on designing of proof of a concept.	Testing: Week 11 J18/UTL	N/A	Within two weeks after the testing
Project Report	Yes (6)/No	~ 4000words	40%	1 to 4	Detailed design of mechanical system, demonstrating project completion and compliance.	Report: Week 10, Midnight, Friday 24 <sup>th</sup> April via Moodle	Week 11, Midnight, Friday 1st May	upon release of final results

## Assignments

The client negotiation and the project reports be submitted electronically through a drop box in Moodle by mid-night, Friday in the weeks indicated in the assessment overview. The project is a group-based task. You will be marked for your personal contribution to the team outcome; this will be done by using team evaluation software available on Moodle.

The project has a group presentation of the final design of the major assignment during the tutorial times in weeks 7 and 8. Although it is a group presentation, individual members will be assessed on design knowledge, presentation, use of visual aids and answering questions from the audience. Prototype testing of the major assignment will be conducted in Week 11 in J18/214. The time will be advised in due course. Your personal contribution to the prototype testing will also be marked through the Moodle Team evaluation software.

The reports will be assessed based on your ability to adhere to the recommended formats for submission and on the quality of your discussion in relation to the content. All calculation tasks will be assessed on accuracy supported by a clear and coherent development of the method according to the course standard format. All CAD modelling/drawing and hand sketches will be assessed on dimensional accuracy, functional proportion and comparison to industry standards as given in AS1100.

The assessment tasks and related information may be found on Moodle page for the course.

### *Presentation*

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*

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (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
- d. Pass/Fail assessment tasks.

### *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 will be no final examination for this course during the formal university examination period.

### **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

### **Recommended Textbook**

Mechanical Engineering Design, J.E. Shigley & C.R. Mischke, 10th Ed, McGraw Hill (Book Store)

### **Suggested readings**

Machine Design: An Integrated Approach, R.L. Norton, 3<sup>rd</sup> Ed, Pearson (Library)

Design of Machine Elements, M.F. Spotts, et. al, 3<sup>rd</sup> Ed, Pearson (Library)

[www.mhhe.com/shigley](http://www.mhhe.com/shigley)

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 reduction in the number of assessments.

## 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](http://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](http://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](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)
- [Equitable Learning Services](#)

# Appendix A: Engineers Australia (EA) Competencies

## Stage 1 Competencies for Professional Engineers

	<b>Program Intended Learning Outcomes</b>
<b>PE1: Knowledge and Skill Base</b>	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
<b>PE2: Engineering Application Ability</b>	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
<b>PE3: Professional and Personal Attributes</b>	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