



Mechanical and Manufacturing Engineering

# Course Outline

Semester 2 2017

**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: J17/408J  
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>

There is no fixed lecturer consultation time for this course. You are requested to formally arrange any meetings with your lecturer through the email address given above. Additional communication will be conducted via the Moodle.

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

Name: Mr Daniel Egger  
Email: [d.egger@unsw.edu.au](mailto:d.egger@unsw.edu.au)

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 6 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

	Day	Time	Location	Weeks
<b>Lectures</b>	Monday	10am -11am	Central Lecture Block 8	1-7, 8-12
	Wednesday	9am - 10am	Central Lecture Block 8	1-7, 8-12
<b>Demonstrations</b>	Tuesday	10am – 12pm or 12pm – 2pm	Quadrangle G032 or G035	2-7, 8-13
<b>CAD Labs</b>	Thursday	10am – 12pm or 12pm – 2pm	Ainsworth 203 or 204	2-7, 8-13
<b>Quizzes</b>	Tuesday	6pm – 7pm	Keith Burrows Theatre	5, 9 & 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 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; belt and chain drive design; rolling element bearing selection; dynamically-loaded bolted connections and welded-joint design; shaft 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. 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 for defining an open-ended design problem, generating alternative conceptual solutions, evaluating these solutions and implementing them.	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.	Accurately apply principles and techniques for determining and representing the safe mechanical behaviour of specified engineering structures and components within a machine system of similar complexity to that encountered within 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 assignments 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

Date	Week	Topic	Topic	Task
24 July	1	L1- Introduction to Course	L2 - Engineering Specification	
31 July	2	L3 -Design Loads	L4 – Parametric Design	
07 Aug	3	L5 - Structures	L6 – Chain Drive 1	
14 Aug	4	L7 - Chain Drive 2	L8 – Belt Drive 1	T1(a)
21 Aug	5	L9 - Belt Drive 2	L10 – Belt Drive 3	T2
28 Aug	6	L11- Bearings 1	L12 – Guest Lecture	T3
04 Sept	7	L13 - Bearings 2	L14 - Shafts 1	
11 Sept	8	L15 - Shafts 2	L16 - Shafts 3	T1(b)
18 Sept	9	L17 - Welded Joint 1	L18 - Welded Joint 2	T4
		<b>Semester Break</b>	<b>Semester Break</b>	
02 Oct	10	Public Holiday	L19 - Welded Joint 3	
9 Oct	11	L20 - Bolted Joint 1	L21 - Bolted Joint 2	
16 Oct	12	L22 - Bolted Joint 3	L23 - Revision	T5
23 Oct	13	No Lecture	No Lecture	T1(c) & T6

The problem solving guidance classes will be conducted on Tuesdays between 10 am and 12 pm or 12pm to 2pm in Quadrangle Building G032 or G035 based on your enrolment. The CAD lab classes will be run on Thursdays in AW203 or 204 between 10am and 12pm or 12pm to 2pm as per your enrolment. Both the problem solving guidance and the CAD lab classes will commence in Week 2 and continued till Week 13.

## 6. Assessment

You will be assessed by way of assignments and quizzes, both of which involve calculations and descriptive material. The assignments are of team based with one major along with two other. In order to pass the course, you must achieve an overall mark of at least 50%.

The following table outlines the list of tasks associated with the course. The set assignments will be available on Moodle at least two weeks before the submission dates. The course will have 3 quizzes. For the quizzes, you will be allowed to bring: One page (one sided, A4 size) of handwritten notes, a copy of Shigley's Mechanical Engineering Design text book (any edition) and a university approved calculator.

## Assessment overview

Task	Assessment	Length	Weight	Assessment criteria	Learning Outcomes assessed	Due date and submission requirements	Deadline for absolute fail	Marks returned
T1(a), T1(b), T1(c)	Major Assignment: Preliminary Design Report	2000 words	45% (2x 10%, 1x 25%)	Project Management plan & initial design concepts	1, 2, 3, 4, 5	Week 4 (11pm, Friday)	Week 5 (11pm, Friday)	2 weeks after submission
	Major Assignment: Design Pitch	20 minutes		Group Presentation		Week 8 & 9 10am-12 pm or 12pm – 2 pm, Tuesday	N/A	1 week after the presentation
	Major Assignment: Final Design Report	5000 words		Detail Design		Week 13 (11 pm, Friday)	Week 14 (11pm, Friday)	Upon release of final results
T2, T4, T6	Quizzes (3)	2x 45 minutes, 1x 60 minutes	25% (2x 7%, 1x 11%)	Belt and Chain design; Bearing and Shaft Design; Weld and Bolt Design	4	Week 5 (6 pm, Tues); Week 9 (6 pm, Tues); Week 13 (6 pm, Tuesday)	N/A	T2 & T4: 1 week after quiz; T6: upon release of final results
T3	Power Transmission elements design	2500 words	15%	Designing chain, belt & selecting bearings for power transmission	1, 2, 3, 4, 5	Week 6 (11 pm, Friday)	Week 7 (11pm, Friday)	2 weeks after submission
T5	Weld & Bolt design	2500 words	15%	Designing welds and bolts for metal joints	1, 4	Week 12 (11 pm, Friday)	Week 13 (11pm, Friday)	2 weeks after submission

## Assignments

Tasks T1(a &c), T3 and T5 will be submitted electronically through a drop box in Moodle by 11 pm, Friday in the weeks indicated in the assessment overview; These are all team based assignments; you will also be marked for your personal contribution to the team outcome. This will be done by using peer review software.

T1(b) is a group presentation of the final design of the major assignment during the tutorial times in weeks 8 and 9. 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.

The written assignments 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 assignments 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.

### *Presentation*

All 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](http://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 will be no final examination for this course during the formal university examination period.

### *Calculators*

You will need to provide your own calculator, of a make and model approved by UNSW, for the quizzes. The list of approved calculators is shown at [student.unsw.edu.au/exam-approved-calculators-and-computers](http://student.unsw.edu.au/exam-approved-calculators-and-computers)

It is your responsibility to ensure that your calculator is of an approved make and model, and to obtain an “Approved” sticker for it from the School Office or the Engineering Student Centre prior to the examination. Calculators not bearing an “Approved” sticker will not be allowed into the examination room.

### **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

### **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)

There are numerous valuable resources available on the web. Students seeking additional resources can also obtain assistance from the UNSW Library. One starting point for assistance is: <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 reduction of workload in assignments and providing more assistance to students to improve their CAD skills.

## 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](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)

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

	<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