UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Term 1 2019

MECH3110

MECHANICAL DESIGN 1

Contents

1. Staff contact details

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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 Daniel Eggler
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Please see the course Moodle.

2. Important links

- Moodle
- Lab Access
- Computing Facilities
- Student Resources
- Course Outlines
- Engineering Student Support Services Centre

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.

Contact hours

	Day	Time	Location
Lectures	Monday	11am – 12noon	Mathews B Theatre
	Wednesday	4pm - 5pm	Mathews B Theatre
Problem Solving Class	Monday	4pm – 6pm	Ainsworth 101
	Tuesday	9am – 11am/11am – 1pm	Ainsworth 101/201
CADLab	Wednesday (Week 11)	11am – 12noon / 12noon – 1pm / 1pm – 2pm	Ainsworth 203/204
	Friday	11am – 12noon / 12noon -1pm / 1pm – 2pm	Ainsworth 203/204
Quiz	Wednesday (Weeks 6 & 10)	6pm – 7pm	Ainsworth G03

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 exploration of 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

Week	Topic	Location	Suggested Readings
1	Introduction to Course	Mathews B Theatre	Lecture notes, Moodle
	Engineering Specification	Mathews B Theatre	Lecture notes, Moodle
2	Design Loads	Mathews B Theatre	Lecture notes, Moodle
	Parametric Design	Mathews B Theatre	Lecture notes, Moodle
3	Structures	Mathews B Theatre	Lecture notes, Moodle

Week	Topic	Location	Suggested Readings
	Welded Joints 1	Mathews B Theatre	Lecture notes, Text Book, Moodle
4	Welded Joints 2	Mathews B Theatre	Lecture notes, Text Book, Moodle
	Bolted Joints 1	Mathews B Theatre	Lecture notes, Text Book, Moodle
5	Bolted Joints 2	Mathews B Theatre	Lecture notes, Text Book, Moodle
	Bearings 1	Mathews B Theatre	Lecture notes, Text Book, Moodle
6	Bearings 2	Mathews B Theatre	Lecture notes, Text Book, Moodle
	Guest Lecture	Mathews B Theatre	Lecture notes, Text Book, Moodle
7	Shafts 1	Mathews B Theatre	Lecture notes, Text Book, Moodle
	Shafts 2	Mathews B Theatre	Lecture notes, Text Book, Moodle
8	Shafts 3	Mathews B Theatre	Lecture notes, Text Book, Moodle
	Gears 1	Mathews B Theatre	Lecture notes, Text Book, Moodle
9	Gears 2	Mathews B Theatre	Lecture notes, Text Book, Moodle
	Welded Joints 3	Mathews B Theatre	Lecture notes, Text Book, Moodle
10	Fatigue analysis	Mathews B Theatre	Lecture notes, Text Book, Moodle
	Revision and		

The problem-solving guidance classes will be conducted on Mondays between 4 pm and 6 pm in Ainsworth 101 or on Tuesdays between 9 am and 11 am or between 11 am and 1 pm in Ainsworth 101 or 201, based on your enrolment. The CAD lab classes will run on Fridays in Ainsworth 203/204 between 11 am and 12 pm, 12 pm and 1 pm, or 1 pm and 2 pm and on Wednesday between 11 am and 12 pm, 12 pm and 1 pm, or 1 pm and 2 pm in Week 11 (Ainsworth 203/204). Both the problem-solving guidance and the CAD lab classes will commence in Week 1 and continue till Week 10.

6. Assessment

Assessment overview

Assessment	Group Project?	If Group, # Students per group	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Major Assignment: Preliminary Design Phase (Client negotiation & Report)	Yes/No	6	2000 words (Preliminary Report)	15% (1x5%, 1x10%)	1, 2, 3, 4	Project Management plan & initial design concepts	Week 3 / 4 (11pm, Friday)	Week 4 / 6 (11pm, Friday)	Two weeks after submission
Major Assignment: Final Design Phase Presentation (10%) / Prototype testing (15%) / Report (20%)	Yes	6	4000 words (Final Report)	45% (1x10%,1x15%, 1x20%)	1, 2, 3, 4	Detail design	Week 7- 8 / 10 (11 pm, Friday)	N/A, N/A, Week 11 (11pm, Friday)	Upon release of final results
Quiz (2)	No	N/A	50 minutes	20% (2x10%)	4	Quiz 1: Weld and bolt design Quiz 2: Shaft and Gears	During Week 6 and 10 Wednesdays (6pm start)	N/A	The class after each assessment (i.e. weeks 5, 8 and 11)
Minor Assignment	No	N/A	2000 words	20%	1, 2 and 3	All course content from weeks 2-12 inclusive.	Week 6 (11 pm, Friday)	Week 6 (11 pm, Friday	Two weeks after submission

Assignments

The preliminary and final reports of the major assignment and the minor assignment report will be submitted electronically through a drop box in Moodle by 11 pm Friday in the weeks indicated in the assessment overview. While the major assignment is a group-based task, the preliminary report is based on individual contribution. 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 minor report is based on your individual contribution.

The major assignment 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 10 in the UTL (116 Willis Annexe). The time will be advised in due course.

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 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.

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 examinations. The list of approved calculators is available at 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 Engineering Student Supper Services Centre prior to the examination. Calculators not bearing an "Approved" sticker will not be allowed into the examination room.

Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that has interfered with your assessment performance, you are eligible to 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, 3rd Ed, Pearson (Library)
Design of Machine Elements, M.F. Spotts, et. al, 3rd Ed, Pearson (Library)
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 revising assessments and providing more hands on experience.

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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 School guidelines and polices, available on the intranet. 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
- Makerspace
- UNSW Timetable
- UNSW Handbook
- UNSW Mechanical and Manufacturing Engineering

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