UNSW AUSTRALIA

Course Outline

Semester 2 2015

Never Stand Still | Engineering | Mechanical and Manufacturing Engineering

MECH3110

MECHANICAL DESIGN 1

Contents

1. Staff Contact Details

Contact details and consultation times for course convenor and lecturer

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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.

2. 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.

There is no parallel teaching in this course.

Contact Hours

	Day	**Time**	**Location**
Lectures	Tuesday	3pm - 4pm	Ritchie Theatre
	Thursday	9am – 10am	CLB 6
Adaptive tutorials	Tuesday	4pm – 6 pm	Colombo LG02/ Quad G032/ Quad G034/ EE 418
	Thursday	10am – 12noon/ 12noon – 2pm	Mech Eng 203/204

Summary 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.

Aims of the Course

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 and MMAN3400. 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 equirements 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 below learning outcomes 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.	Demonstrate the ability to collaborate effectively within a design team to accomplish specified tasks within given deadlines.	PE 3.2, 3.5, 3.6
4.	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
5.	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

3. 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 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.

4. Course schedule

		TUESDAY 3-4 **Ritchie Theatre**	**THURSDAY 9-10** **CLB 6**	**DUE**
Date	**Week**	**Topic**	**Topic**	**Task**
28 July	**1**	L1-Introduction to Course	L2- Engineering Specification	
	2nd Hour	NO PROBLEM SOLVING GUIDANCE	NO PROBLEM SOLVING GUIDANCE	
	3rd Hour			
04 Aug	**2**	L3-Design Loads	L4- Parametric Design	
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			
11 Aug	**3**	L5- Structures 1	L6 – Chain Drive 1	
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			
18Aug	**4**	L7 - Chain Drive 2	L8 – Belt Drive 1	T1
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			
25 Aug	**5**	L9- Belt Drive 2	L10 – Belt Drive 3	
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			
01 Sept	**6**	L11- Guest Lecture	L12- Bearings 1	T2
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			
08 Sept	**7**	L13- Bearings 2	L14 - Shafts 1	T3
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			
15 Sept	**8**	L15- Shafts 2	L16- Shafts 3	T4
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	ME203/204	
	3rd Hour			
22 Sept	**9**	L17 Welded Joint 1	L18 - Welded Joint 2	T5
	2nd Hour	Problem solving guidance	Cad Labs ME203/204	

	3rd Hour	Colombo LG02/ Quad G032/ Quad G034/ EE 418		
		Semester Break	**Semester Break**	
06 Oct	**10**	L19 - Welded Joint 2	L20- Welded Joint 3	T6
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			
13 Oct	**11**	L21 – Bolted Joint 1	L22 – Bolted Joint 2	
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			
20 Oct	**12**	L23 – Bolted Joint 3	L24 - Revision	T7
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			
27 Oct	**13**	NO LECTURE	NO LECTURE	T8 & T9
	2nd Hour	Problem solving guidance Colombo LG02/ Quad G032/ Quad G034/ EE 418	Cad Labs ME203/204	
	3rd Hour			

5. Assessment

General

You will be assessed by way of assignments and quizzes, both of which involve calculations and descriptive material. The assignments consist of both individual and team based contribution as listed below.

Individual Assignments (2)	20%
Group Assignments (4)	55%
Quizzes (3)	25%
Total	100%

In order to pass the course, you must achieve an overall mark of at least 50%.

Assignments

The following table outlines the list of tasks associated with the course. The set assignments will be available on Moodle. The quizzes will run during Tuesday adaptive tutorial times of the respective weeks.

Task	Assignment	Mark	Contri-bution	Learning Outcomes assessed	Assessment criteria	Due
T1	Preliminary Design Report	10%	Group	1, 2, 3, 4, 5	Project Management plan & initial design concepts of a bogey platform system	Week 4 (11 pm, Friday)
T2	Belt, Chain & Bearing Assignment	15%	Group	1, 2, 3, 4, 5	Designing chain, belt & selecting bearings for power transmission	Week 6 (11 pm, Friday)
T3	Quiz 1	6%	Individual	4	Belt, Chain & Bearing	Week 7 (4 pm Tuesday)
T4	Shaft & flywheel Assignment (on line)	10%	Individual	1, 4	Shaft and Flywheel Design	Week 8 (11 pm, Friday)
T5	Quiz 2	6%	Individual	4	Shaft Design	Week 9 (4 pm Tuesday)
T6	Welding Assignment (on line)	10%	Individual	1, 4	Designing welds for metal joints	Week10 (11 pm, Friday)
T7	Bolt Assignment	10%	Group	1, 2, 3, 4, 5	Designing bolts for metal joints	Week 12 (11 pm, Friday)
T8	Final Design Report	20%	Group	1, 2, 3, 4, 5	Detail Design of a bogey platform system	Week 13 (11 pm, Friday)
T9	Quiz 3	13%	Individual	4	Weld and Bolt Design	Week 13 (4 pm Tuesday)

Submission and Marking of Assignments

All the assignments will be submitted electronically through a drop box in Moodle by 11 pm, Friday in the weeks indicated in the course schedule. As Assignments T1, T2, T7 & T8 are team based; you will also be marked for your personal contribution to the team outcome. This will be done by using a peer review software.

All written assignments will be assessed 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.

Late submissions will be penalised 5 marks per calendar day (including weekends). An extension may only be granted in exceptional circumstances. Where an assessment task is worth less than 20% of the total course mark and you have a compelling reason for being unable to submit your work on time, you must seek approval for an extension from the course convenor ***before the due date***. Special consideration for assessment tasks of 20% or greater must be processed through https://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.

Assessment Criteria

The following criteria will be used to grade assignments:

For report-style assignments the following criteria will be used:

- Identification of key facts and the integration of those facts in a logical development.
- Clarity of communication—this includes development of a clear and orderly structure and the highlighting of core arguments.
- Sentences in clear and plain English—this includes correct grammar, spelling and punctuation.
- Correct referencing in accordance with the prescribed citation and style guide.

All other assignments involve numerical calculations, for which the following criteria will be used:

- Accuracy of numerical answers.
- All working shown.
- Use of diagrams, where appropriate, to support or illustrate the calculations.
- Use of graphs, were appropriate, to support or illustrate the calculations.
- Use of tables, where appropriate, to support or shorten the calculations.
- Neatness.

Examination

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 https://student.unsw.edu.au/exam-approved-calculators-and-computers

Special Consideration and Supplementary Assessment

For details of applying for special consideration and conditions for the award of supplementary assessment, see Administrative Matters, available on the School website and on Moodle, and the information on UNSW's Special Consideration page.

6. 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

There are numerous valuable resources available on the web and additional sources will be provided in lectures and adaptive tutorials.

Students seeking additional resources can also obtain assistance from the UNSW Library. One starting point for assistance is: info.library.unsw.edu.au/web/services/services.html

7. Course evaluation and development

Feedback on the course is gathered periodically using various means, including the Course and Teaching Evaluation and Improvement (CATEI) 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 introduction of adaptive tutorials and more interactivity.

8. 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: https://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: http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Further information on School policy and procedures in the event of plagiarism is presented in a School handout, Administrative Matters, available on the School website.

9. Administrative Matters

You are expected to have read and be familiar with *Administrative Matters*, available on the School website: https://www.engineering.unsw.edu.au/mechanical-engineering/sites/mech/files/u41/S2-2015-Administrative-Matters_20150721.pdf

This document contains important information on student responsibilities and support, including special consideration, assessment, health and safety, and student equity and diversity.

Expectations of students

UNSW expects regular attendance at lectures and problem solving guidance/laboratory classes. Although exceptions may be made for special circumstances, we do expect University commitments to take precedence over regular work activities, holidays etc. UNSW has rules for computer use, for example, for email and online discussion forums.

Kana Kanapathipillai
20/07/2015

Appendix A: Engineers Australia (EA) Professional Engineer Competency Standards

	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