UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Semester 2 2017

MMAN2130

DESIGN AND MANUFACTURE

Contents

1. Staff contact details

Contact details and consultation times for course convenor

Name: Prof. S. Kara
Office location: Ainsworth 301A
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Moodle: https://moodle.telt.unsw.edu.au/login/index.php

Consultation concerning this course is available on Tuesday 1300 –1700, whenever the lecturer is not otherwise engaged.

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

Name: Ashley Thornton
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Tel: (02) 9385 6851
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Name: Rosy Browell
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Name: Eben Brebner
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Name: Joseph Francis Salim
Email: joseph.salim@unsw.edu.au

Contact preferred via email; consultation by appointment only. Students are also encouraged use Moodle for enquiries.

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 7.5 hrs (2 hrs lecture, 1.5 hrs CAD lab and 4 hrs of TAFE training) 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**
Lectures	Tuesday	10am - 12noon	Chemical Sc M18 (K-F10-M18)
CAD Labs	Tuesday	12pm – 1:30pm	Ainsworth 203 (K-J17-203)
	Tuesday	1:30am – 3:00pm	Ainsworth 203 (K-J17-203)
TAFE	Tuesday	4:30pm – 9:30pm	Check TAFE information on Moodle
	Wednesday	4:30pm – 9:30pm	Check TAFE information on Moodle
	Thursday	4:30pm – 9:30pm	Check TAFE information on Moodle

TAFE times include travel time (e.g. 4:30pm class starts at 5:00pm). 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 introduces basic aspects of design and manufacturing, process selection, manufacturing processes, material selection based on material and physical properties and the use of computers in the design process. It is one of the introductory technology-based courses in the school. This course develops an appreciation of the concepts involved with product development and manufacture. The other subjects in the degree program further develop the theoretical and analysis methods for design and development.

This is a project-based course delivered with blended approach. The project selected allows students to work individually and in a team environment to achieve the final objective, which

is a workable product. As part of the project, students are asked to develop a product from a page of functional requirements by developing a concept sketch, material selection, detail engineering drawings, process plan and finally making the product in a workshop. At the end of the semester, the products are tested. The necessary skills required for carrying out the project is taught during the semester by using face-to-face and e-learning approaches. In carrying out this work, the student is exposed to design principles and drawing practices which include Computer aided Design and Drafting, the link between material selection and design, manufacturing processes and practical selection and limitations of manufacturing components and products. A continuing emphasis is placed on group work and report writing essential to engineering.

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.	Understand the importance and relevance of graphical communication in engineering, be able to represent a three dimensional object in two dimensional space in accordance with AS-1100 technical drawing standards and conventions and be able to interpret two dimensional engineering drawings and produce isometric sketches of relevant components.	PE 1.3, PE1.4, PE2.2
2.	Be able to use the SolidWorks modeling software and application to create a range of engineering components in solid representation to create production drawings of engineering components in accordance with AS-1100 technical drawing standards.	PE1.3, PE2.2
3.	Be familiar with the basic engineering and physical properties of common engineering materials and how to select them for a given design and familiar with the link between product design, material selection and manufacturing.	PE1.3, PE1.5, P2.4
4.	Be able to understand some manufacturing processes and their capabilities.	PE1.3, PE2.4
5.	Be able to work in a group to determine the manufacturing requirements and functionality of the product.	PE2.4, PE3.5, PE3.6
6.	Be able to relate to economic requirements for manufacturing and thus optimise the production of the component.	PE2.4

4. Teaching strategies

This course is conducted as a project based course in which the material presented is related to the tasks that a student needs to attempt to achieve the final goal of the project. Therefore, the presentation of the material will vary from week to week. Initially there will be lectures and tutorial/problem solving classes to guide you through the project, while in the

later weeks you will be required to be self-sufficient to finalise the project. However, the project will be assessed over the different periods for the milestones achieved.

5. Course schedule

W	Lecture	Tutorial	CAD Lab	TAFE*	Location	Suggested Readings
1	Introduction to the subject	Introduction to Group Project	No CAD lab	No TAFE	Chemical Sc M18 (K-F10-M18)	Week 1 Lecture Notes and Pump Requirement Specification
2	Concept Sketching	Project description and concept sketching	Introduction to Solidworks and Sketching	Measuring	Chemical Sc M18 (K-F10-M18)	Week 2 Lecture Notes
3	Engineering Drawings	Pump part engineering drawing review	3D Modelling in Solidworks	Templating 1	Chemical Sc M18 (K-F10-M18)	Week 3 Lecture Notes, CAD Lab notes and Boundy reference book
4	Limits Fits & Tolerances (LFT)	Applications of LTF in pump design	Hole wizard and drawing	Templating 2	Chemical Sc M18 (K-F10-M18)	Week 6 Lecture Notes and Kalpakjian reference book
5	Process planning	Process planning of a part	Advance drawing and assembly	Milling	Chemical Sc M18 (K-F10-M18)	Week 4 Lecture Notes and Boundy reference book
6	Introduction to Manufacturing Technologies	Implications for the pump project	Advance assembly and BOM	Turning 1	Chemical Sc M18 (K-F10-M18)	Week 5 Lecture notes and Kalpakjian reference book
7	Advanced Manufacturing Technologies	Implication for the pump project	Additional techniques in Solidworks 1	Turning 2	Chemical Sc M18 (K-F10-M18)	Week 7 Lecture notes and Kalpakjian reference book
8	Design for high volume Manufacture	High volume design of a part	Additional techniques in Solidworks 2		Chemical Sc M18 (K-F10-M18)	Week 8 Lecture notes
9	Material Selection Introduction	Implications of the pump project	Additional techniques in Solidworks 3		Chemical Sc M18 (K-F10-M18)	Week 9 Lecture Notes and Ashby reference book
10	Material Selection - Detail	Implications of the pump project	Review of CAD	Pump manufacture	Chemical Sc M18 (K-F10-M18)	Week 10 Lecture Notes and Ashby reference book
11	Material Selection Applications	Implications of the pump project	CAD test	Pump Manufacture	Chemical Sc M18 (K-F10-M18)	Week 11 Lecture Notes and Ashby reference book
12	Product Life Cycle Design and Sustainability	No tutorial	No CAD lab	Pump Manufacture	Chemical Sc M18 (K-F10-M18)	N/A
13	Pump Testing	No lecture and tutorial	No CAD lab	No TAFE	Level 1 Fluids Lab, Willis Annex	N/A

TAFE: Schedule for TAFE will vary for each group due to the TAFE session break. See the actual group schedule on Moodle.*

6. Assessment

Assessment overview

Assessment	Length	Weight %	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Concept Sketch	TBA on Moodle	5%	1,2,3,4	Detailed Assessment Criteria will be uploaded on Moodle, Individual submission	Week 3, hardcopy in the classroom	N/A	Two weeks after submission
Engineering Drawing	TBA on Moodle	5%	1,2,3,4	Detailed Assessment Criteria will be uploaded on Moodle, Individual submission	Week 5, hardcopy in the classroom	N/A	Two weeks after submission
Manufacturability Review	TBA on Moodle	15%	1,2,3,4,5,6	Detailed Assessment Criteria will be uploaded on Moodle, Individual submission	Week 6, online	N/A	Two weeks after submission
CAD Test	TBA on Moodle	15%	1,2,3,4	Detailed Assessment Criteria will be uploaded on Moodle, Individual assessment	Week 9 During CAD Lab & online submission	N/A	Two weeks after submission
Final Report	TBA on Moodle	30%	1,2,3,4	Detailed Assessment Criteria will be uploaded on Moodle, Group + Individual assessment	Week 12**,** online	N/A	Two weeks after submission
Prototype Testing	TBA on Moodle	10%	1,2,3,4,5,6	Detailed Assessment Criteria will be uploaded on Moodle, Group submission	Week 13 Level 1, Fluids Lab, Willis Annex	N/A	Two weeks after submission
TAFE Assessments	TAFE will announce	20%	5,6	Individual assessment	TAFE will announce	N/A	TAFE will announce

Assignments

You are assessed by way of a product development project which involves designing and manufacturing a product based on given functional specifications. This project will test your ability to demonstrate applied knowledge, which you will be expected to perform as an engineering student. As result, there will be a continuous assessment scheme applied in the course.

The weighting of the individual assessment components will be as follows (page 7) with full details on each assessment provided under Moodle/Assignments.

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% 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

You must be available for all tests and examinations. Final examinations for each course are held during the University examination periods, which are June for Semester 1 and November for Semester 2.

Provisional Examination timetables are generally published on myUNSW in May for Semester 1 and September for Semester 2.

For further information on exams, please see the Exams section on the intranet.

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 shown 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 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

(1) *Manufacturing Engineering and Technology*, S. Kalpakjian and S R Schmid. Prentice Hall
(2) *Engineering Drawing*, A. W. Boundy, McGraw Hill (7th Edition).
(3) *Material Selection in Mechanical Design,* Ashby, M., Elsevier.
(4) *Dimensioning and Tolerancing for Function and Economic Manufacture*, L. E. Farmer, Blueprint Publications.
(5) *Manufacturing Processes* B.H. Amstead, P.F. Ostwald and M.L. Begeman.
(6) *Materials and Processes in Manufacturing*, E.P. Degamo, J.P. Black and R.A. Kohser.
(7) *Product Design and Process Engineering*, B.W. Niebel and A.B. Draper.
(8) *Manufacturing Processes*, H.W. Yankee.
(9) Moodle based learning modules.

UNSW Library website: https://www.library.unsw.edu.au/

The course will be administered by using Moodle. Therefore, course administration and lecture materials will be uploaded to Moodle. Students are advised to use Moodle for class communication.

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 streamlining of assignments and providing more information on pump design information early in the course.

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 polices, 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