UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Term 3 2019

MMAN2130

DESIGN AND MANUFACTURING

Contents

1. Staff contact details

Contact details and consultation times for course convenor

Name: Mr. D. Lyons CEng FRINA MIEAust GCULT
Office location: Ainsworth Building J17 208D
Tel: (02) 9385 6120
Email: david.lyons@unsw.edu.au
Moodle: https://moodle.telt.unsw.edu.au/course/view.php?id=44600

Consultation time concerning this course:
Face-to-face: Please **email** the course convenor first, to confirm availability.
By email: At any time.

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

Lecturer on Tuesdays 4-6pm: David Lyons
Lecturer on Thursdays 3-5pm: tba
Name: Alex Lau (head demonstrator)
Email: alex.lau@unsw.edu.au

Please see the course Moodle.

2. Important links

- Moodle
- Lab Access
- 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 7.5 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 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 Weeks 1-10 "LEC"	Tuesday, *OR*	4pm-6pm	TETB (H6) G16
	Thursday	*3pm-5pm*	*TETB (H6) G16*
TAFE "OTHER" at Ultimo Weeks 1-9 (Wed classes); 1-3,5-10 (Mon class): See Moodle for address TAFE PPE safety rules apply: see Moodle	Monday	5pm-9pm	Ultimo, *OR*
	Wednesday	*12noon-4pm*	*Ultimo*, *OR*
	Wednesday	*5pm-9pm*	*Ultimo*
	Note: On UNSW timetable, TAFE shows 1 hour earlier start to allow for travel time to Ultimo		
Pump testing Week 11	Tuesday (to be confirmed)	9am-5pm	UGTL (J18)
CAD Labs "TLB" Weeks 2-10	Monday	10:30am-12noon	Ainsworth (J17) 204, *OR*
	Monday	*12noon-1:30pm*	*Ainsworth (J17) 204*, *OR*
	Monday	*2:00pm-3:30pm*	*Ainsworth (J17) 204*

****Please refer to your class timetable for the learning activities you are enrolled in &/or assigned to and attend only those classes (affects your Lecture "LEC", CAD Lab "TLB" and TAFE "OTHER" day/time). These are chosen as part of your class registration:** https://student.unsw.edu.au/enrol/annual/class

(i) You CANNOT swap CAD or TAFE classes week to week. No "make-ups" possible for TAFE as you must work in your Pump Group.

(ii) You cannot miss more than one TAFE lesson (during weeks 2 to 10) – attendance for safety briefing in Week 1 at TAFE is compulsory. TAFE takes the roll and issues a certificate for the TAFE component of MMAN2130.

Sporting fixtures, personal reasons etc. are not acceptable reasons for missed attendances. (See (ii) above).

Summary and Aims of the course

This is one of the introductory technology-based design courses in the school. This course develops an appreciation of the concepts involved with product development and manufacture. The other courses in the degree program further develop the theoretical and analysis methods for design and development.

- 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.

- There are four main teaching and learning modalities in the course:

    - Face-to-face interactive lectures/design seminars
    - CAD lab practice
    - TAFE College hands-on workshop manufacturing processes and practice
    - Group project physical testing and evaluation

- This is a project-based course delivered by a blended (face-to-face/online) 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 term, the products are tested. The necessary skills required for carrying out the project is taught during the term 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 (Solidworks CAD), 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 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.

You will be placed in a (4 or) usually 5-member Pump Group: Details announced in the Week 1 lecture and on Moodle.

There will be TAFE workshops for hands-on experience in creating the design that you have developed. In relation to the product development, it is expected that the students will be able to search for information and requisites for the development of the product using the web, library and books which are listed as resources for the product development.

5. Course schedule

Week	Topic	Location	Lecture Content	CAD Lab Content	Suggested Readings
Week1 *TAFE starts this week*	Intro and Group Project Description	H6 G16	Intro to MMAN2130, Group project outline, TAFE groups, venue details & CAD Lab info.	No CAD lab	Week 1 See Moodle and Pump Requirement Specification
Week2 *CAD labs start this week*	Concept Sketching	H6 G16	Techniques useful for concept sketching	Introduction to SolidWorks and 2D sketching; 3D Operations	Week 2 See Moodle
Week3	3D Part Modeling	H6 G16	Sketching & Modeling parts in 3D	Engineering drawing. Holes and hole wizard.	Week 3 See Moodle
Week4	Engineering Drawings	H6 G16	AS1100 standards, dimensioning	Public holiday	Week 4 See Moodle and Engineering Drawing Assessment Guide
Week5	Limits Fits & Tolerances	H6 G16	Limits, Fits and tolerances and their application in design.	Mates and assemblies; BOM.	Week 5 See Moodle
Week6	Process Planning	H6 G16	Process Plan Assembly Plan BOM	***CAD test 1***	Week 6 See Moodle
Week7	Design for high volume Manufacture	H6 G16	Design for Manufacturability, Material Selection and High Volume Manufacturing	Fasteners, Additional techniques: Patterning & Mirroring**.**	Week 7 See Moodle + Final Report Assessment Guide
Week8	Material Selection Introduction	H6 G16	Utilizing Material Indices	***CAD test 2***	Week 8 See Moodle
Week9 (*final Wed TAFE this week*)	Material Selection - Detail	H6 G16	Design for Manufacture, Material Selection and High Volume Manufacturing	Assembly drawing revision; Final report CAD reqmnts.	Week 9 See Moodle
Week10 (*final Mon TAFE this week)*	Revision	H6 G16	Revision	***CAD test 3***	Week 10 See Moodle
Week 11	***Pump operation in UGTL***				

6. Assessment

Assessment overview

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. The weighting of the individual assessment components will be as follows in the table with full details on each assessment provided under Moodle/Assignments.

Assessment	Length	Weight %	Group/ Individual	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
1: Engineering Drawing & Manufacturability Review	TBA on Moodle	25	Group/Individual	1,2,3,4,5,6	Detailed Assessment Criteria will be uploaded on the Moodle, Individual submission	Week 6 on Moodle	Week 7	Two weeks after submission
2. CAD tests	45 min in-class	10	Individual	1,2	Accuracy, on-time completion	Weeks 6,8,10	By arrangement if permitted absent	One week on Moodle
3. Final Report	TBA on Moodle	35	Group/Individual	1,2,3,4	Detailed Assessment Criteria will be uploaded on the Moodle	Week 11 on Moodle	Week 13	Two weeks after submission
4(a) Prototype pump completion & operation	TBA on Moodle	10	Group	1,2,3,4,5,6	Detailed Assessment Criteria will be uploaded on the Moodle, Group submission	Week 11 (Tues) Operation	Week 11 (Tues)	Two weeks after submission
4(b) TAFE Assessments	TAFE will announce	20	Individual	5,6	Individual assessment	TAFE will announce	Ref TAFE	Two weeks after submission

Assignments

Presentation

WRITTEN SUBMISSIONS MUST BE TYPED (including any equations and calculations) and shall be submitted via Moodle with a standard School cover, sheet which is available from this course's Moodle page. Hand sketches should be scanned and all drawings use Solidworks CAD software, with 2D drawings compliant with AS1100.

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 is no examination for this course.

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

The UNSW Library has several of the following in eBook format which are gradually being linked into this course's Moodle lesson-books.. Announcement may be found in Moodle.

- *Manufacturing Engineering and Technology*, S. Kalpakjian and S R Schmid. Prentice Hall
- *Engineering Drawing*, A. W. Boundy, McGraw Hill (7th Edition).
- *Material Selection in Mechanical Design,* Ashby, M., Elsevier.
- *Dimensioning and Tolerancing for Function and Economic Manufacture*, L. E. Farmer, Blueprint Publications.
- *Manufacturing Processes* B.H. Amstead, P.F. Ostwald and M.L. Begeman.
- *Materials and Processes in Manufacturing*, E.P. Degamo, J.P. Black and R.A. Kohser.
- *Product Design and Process Engineering*, B.W. Niebel and A.B. Draper.
- *Manufacturing Processes*, H.W. Yankee.
- Moodle based learning modules.
- AS1100 via the university library SAI Global subscription: http://subjectguides.library.unsw.edu.au/engineering go to Standards tab on right-hand side; Australian standards (via SAI Global). Log in with zPass, search Australian Standard AS1100 *Technical drawing* in several parts – ensure you access current version.

Additional material can be found at the UNSW Library via https://www.library.unsw.edu.au/

Additional materials provided in Moodle

This course will be administered by the use of 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

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 streamlining of assignments and providing more information on pump design information early in the course. The Digital Uplift of this course in accordance with the UNSW 2025 Strategy was undertaken during the running of the course in semester 2, 2018. Full implementation has been implemented for T2-2019. Lecture material has been posted in Moodle lesson books and traditional lecture time transformed by a "flipping" process into interactive, flat-space (when available) design conclaves/seminars.

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 UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Computing Facilities
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Disability Support Services
- Health and Safety
- Lab Access

David Lyons
Chartered Engineer
Course Convenor
5 September 2019
Rev 02

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