UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

# Course Outline

Semester 1 2018

# MMAN2130

# DESIGN AND MANUFACTURING

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# 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

**Consultation time concerning this course:**
Face-to-face: Please **email** the course convenor first to confirm his availability, generally on Tuesday between 1000–1300 and when not otherwise engaged.
By email or course Moodle: At other times.

**Contact details and consultation times for additional lecturers/demonstrators/lab staff as below, subject to later updates – see course Moodle.**

Name: Joseph Salim (main demonstrator)
Email: joseph.salim@unsw.edu.au

Name: Rosy Browell
Email: r.browell@unsw.edu.au

Name: Alex Pui Hei Lau
Email: alex.lau@student.unsw.edu.au

Name: Joseph Rowlands
Email: jrowlands1993@outlook.com

Name: Rowena Dai
Email: rowena.dai@gmail.com

Name: (Stefan) Petar Belic
Email: petar@reneltbelicdesign.com.au

Contact via email is preferred; face-to-face consultation is by appointment only. Students are also encouraged to use Moodle for enquiries:

Moodle: https://moodle.telt.unsw.edu.au/login/index.php

# 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 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** | Monday | 1pm - 3pm | Ainsworth J17 G03 |
| (Web) | Any | Any | Moodle |
| | | | |
| **CAD Labs** | Monday | 3pm – 4:30pm | Ainsworth 204 |
| Weeks 2 – 8(*9) | Monday | 3pm – 4:30pm | Ainsworth 203 |
| | Monday | 4:30pm – 6pm | Ainsworth 204 |
| | Tuesday | 4pm – 5:30pm | Ainsworth 203 |
| ***Note: Wed 25 Apr (Week 8) is a Public Holiday – moved to Wed 2 May (Week 9)** | Wednesday* | 9am – 10:30am | Ainsworth 204 |
| | Wednesday* | 10:30 – 12noon | Ainsworth 204 |
| | Wednesday* | 2pm – 3:30pm | Ainsworth 204 |
| | Wednesday* | 2pm – 3:30pm | Ainsworth 203 |
| | | | |
| **TAFE** | Wednesday | 4:30pm – 9:30pm | UTL (Ultimo TAFE) |
| Weeks 2-5**, 6-13 | Thursday | 12noon – 5pm | UTL |
| | Thursday | 4:30pm – 9:30pm | UTL |
| ****Note: Fri 30 Mar (Week 5) is Public Holiday – no TAFE. Check Moodle for reschedule.** | Friday** | 9am – 2pm | UTL |
| | Friday** | 4:30pm – 9:30pm | UTL |

**Please refer to your class timetable for the learning activities you are enrolled in &/or assigned to and attend only those classes (affects your CAD Lab and TAFE day/time).**

## 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.
    - 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 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 (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.

There will be laboratory work 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#/ Mon-Date | Topic | Location | Lecture Content | CAD Lab Content | Suggested Readings |
|---|---|---|---|---|---|
| Week 1<br>26/2/18 | Intro and Group Project Description | Ainsworth G03 | Intro to MMAN2130, Group project outline, TAFE groups, venue details & CAD Lab info. drawings. | No CAD lab | Week 1 Lecture Notes and Pump Requirement Specification |
| Week 2<br>5/3/18 | Concept Sketching | Ainsworth G03 | Techniques useful for concept sketching | Introduction to SolidWorks and sketching | Week 2 Lecture Notes |
| Week 3<br>12/3/18 | 3D Part Modeling | Ainsworth G03 | Sketching & Modeling parts in 3D | 3D Operations | Week 3 Lecture Notes |
| Week 4<br>19/3/18 | Engineering Drawings | Ainsworth G03 | AS1100 standards, dimensioning | Holes and hole wizard | Week 4 Lecture Notes and Engineering Drawing Assessment Guide |
| Week 5<br>26/3/18<br>*Census date: 31 Mar* | Limits Fits & Tolerances | Ainsworth G03 | Limits, Fits and tolerances and their application in design. | Engineering drawing | Week 5 Lecture Notes |
| MSB<br>2/4/18 | **Mid-Session Break** | | | | |
| Week 6<br>9/4/18 | Process Planning | Ainsworth G03 | Process Plan<br>Assembly Plan<br>BOM | Assemblies | Week 6 Lecture Notes |
| Week 7<br>16/4/18 | Design for high volume Manufacture | Ainsworth G03 | Design for Manufacturability, Material Selection and High Volume Manufacturing | Fasteners | Week 7 Lecture Notes + Final Report Assessment Guide |
| Week 8<br>23/4/18 | Material Selection Introduction | Ainsworth G03 | Utilizing Material Index's | Patterning & Mirroring | Week8 Lecture notes |

| Week#/ Mon-Date | Topic | Location | Lecture Content | CAD Lab Content | Suggested Readings |
|---|---|---|---|---|---|
| In Week 8 25/4/18 | **Wednesday - Public Holiday: no CAD Lab or TAFE – check Moodle for reschedule** | | | | |
| Week 9 30/4/18 | Material Selection - Detail | Ainsworth G03 | Design for Manufacture, Material Selection and High Volume Manufacturing | CAD Test | Week 9 Lecture notes |
| Week 10 7/5/18 | Advanced Manufacturing Techniques | Ainsworth G03 | Design for Manufacture, Material Selection and High Volume Manufacturing | No CAD Labs | Week 10 Lecture Notes |
| Week 11 14/5/18 | Product Life Cycle Design and Sustainability | Ainsworth G03 | Design for Manufacturability, Material Selection and High Volume Manufacturing | No CAD Labs | Week 11 Lecture Notes and Final Report Assessment Guide |
| Week 12 21/5/18 | Prototype testing | TBD | Prototype testing | No CAD Labs | N/A |

# 6. Assessment

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 with full details on each assessment provided under Moodle/Assignments.

## Assessment overview

| Assessment | Length | Weight % | Learning outcomes assessed | Assessment criteria | Due date and submission requirements | Deadline for absolute fail | Marks returned |
|---|---|---|---|---|---|---|---|
| 1 (a): Concept Sketch + Engineering Drawing | TBA on Moodle | 15 | 1,2,3,4 | Detailed Assessment Criteria will be uploaded on the Moodle, Individual submission | Week 5, in the classroom | Week 7 (Mon) | Two weeks after submission |
| 1 (b): Manufacturability Review | TBA on Moodle | 10 | 1,2,3,4,5,6 | Detailed Assessment Criteria will be uploaded on the Moodle, Individual submission | Week 7, in the classroom | Week 9 (Mon) | Two weeks after submission |
| 2: CAD Test | TBA on Moodle | 10 | 1,2,3,4 | Detailed Assessment Criteria will be uploaded on the Moodle, Individual assessment | Week 9 During CAD Lab | Ref. Moodle | Two weeks after submission |
| 3. Final Report | TBA on Moodle | 35 | 1,2,3,4 | Detailed Assessment Criteria will be uploaded on the Moodle, Group + Individual assessment | Week 12, in the classroom | Mon 4 June 2018 | Two weeks after submission |
| 4 (a): Prototype Testing | TBA on Moodle | 10 | 1,2,3,4,5,6 | Detailed Assessment Criteria will be uploaded on the Moodle, Group submission | Week 13 | Week 13 | Two weeks after submission |
| 4 (b): TAFE Assessments | TAFE will announce | 20 | 5,6 | Individual assessment | TAFE will announce | Ref TAFE | TAFE will announce |

## 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. **WRITTEN SUBMISSIONS MUST BE TYPED (including any equations and calculations). Hand sketches can be scanned and all drawings must be in CAD format to AS1100.**

*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.

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 is a compulsory CAD test in Week 9. You must be available on the day and time for this test. There is no final examination for this course.

*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, CAD labs and TAFE. 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.
(10) 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**

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

*David Lyons*
*2 Feb 2018*

# 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 |