UNSW AUSTRALIA

# Course Outline

Semester 1 2016

Never Stand Still | Engineering | Mechanical and Manufacturing Engineering

# MANF9543

# COMPUTER AIDED DESIGN & MANUFACTURE

# Contents

# 1. Staff Contact Details

**Contact details and consultation times for course convenor**

Name: Dr Ronald Chan
Office location: J17, room 507
Tel: (02) 9385 1535
Email: r.chan@unsw.edu.au

Consultation for this course is available immediately after each lecture. For additional consultation, please make an appointment with the staff by email.

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

Name: Dr Erik van Voorthuysen
Office location: J17, room 507
Tel: (02) 9385 4147
Email: erikv@unsw.edu.au

Consultation for this course is available immediately after each lecture. For additional consultation, please make an appointment with the staff by email.

Contact details of additional demonstrators will be given in class.

# 2. Course details

**Credit Points:**

This is a 6 unit-of-credit (UoC) course, and involves 4 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 | 12noon - 2pm | Ainsworth 202 |
| **Demonstrations** | Tuesday | 2pm – 4pm | Ainsworth 203 |

## Summary of the Course

This course focuses on the principles and applications of CAD/CAM in product and manufacturing design and is highly relevant to future trends in automation and manufacturing processes. It teaches the underlying theory of CAD/CAM, but most importantly teaches students the skills needed to actually design using CAD/CAM. The School operates a number of design platforms, most notably SolidWorks and SolidCAM software. The course teaches the essential steps that one takes to develop a product from concept to manufacture starting with CAD, and progressing to simulation, using CAM and CAE software support.

## Aims of the Course

This course will enable students to explore and gain further understanding of how CAD/CAM can be used in Manufacturing Industry. This course will also provide students with opportunity to explore innovation in design using both SolidWorks and SolidCAM software.

## 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. | Apply the design concepts for any design task in CAD/CAM environment. | PE1.1, PE1.5, PE2.3 |
| 2. | Apply the best use of Computer Aided Manufacture techniques in a modern factory. | PE1.2, PE2.2, PE2.3 |
| 3. | Create a concept of CAD/CAM application for the Rapid Prototyping Technology. | PE1.2, PE2.2, PE2.3 |
| 4. | By the conclusion of this course the student will be able to develop knowledge and skills in designing using both SolidWorks and SolidCAM software. | PE2.2, PE2.3, PE3.3 |

# 3. Teaching strategies

Teaching strategies used in this course will be based on:

1. Face-to-face lectures in which CAD/CAM materials will be divided into 3 parts: CAD, CAM and CAD/CAM and beyond. In addition, there will be two lectures reserved for application of CAD/CAM/CAE by a guest speaker.
2. Assignment 1 and Quiz 1 are assigned to prompt students in applying engineering design and CAD. Assignment 2 is a group assignment with an individual submission and Quiz exposes you to the real world situation by applying CAD and CAM to produce an actual product. Demonstrations will be provided during the course of completing this project. The group demonstrations are arranged on a one-to-one basis with the demonstrators to develop the innovation aspects of the design process.

# 4. Course schedule

| **Date** | **Topic** | **Location** | **Lecture Content** | **Demonstration/Lab Content** |
|---|---|---|---|---|
| 1/3/16 | Introduction to CAD/CAM | Ainsworth 202 | Course overview and group discussion | No demonstration in Week 1 |
| 8/3/16 | CAD & engineering design | Ainsworth 202 | Design philosophy, types of design and design process | Introduction to SolidWorks |
| 15/3/16 | CAD system and group technology | Ainsworth 202 | Product development, product life cycle and manufacturing paradigm | Part design and assemblies |
| 22/3/16 | CAD in practice | Ainsworth 202 | Applications CAD in industry | Engineering drawing |
| 5/4/16 | Introduction to CAM | Ainsworth 202 | Overview of CAM | Rendering and animation |
| 12/4/16 | Design for manufacturing and manufacturing processes | Ainsworth 202 | Classification and selection of manufacturing processes and functions | Quiz 1 |

| | | | | |
|---|---|---|---|---|
| 19/4/16 | CAM system and operation I | Ainsworth 202 | CAM system and operation overview | Introduction to SolidCAM |
| 26/4/16 | CAM system and operation II | Ainsworth 202 | Milling I and fits and tolerances | Project support and group discussion |
| 3/5/16 | CAM system and operation III | Ainsworth 202 | Milling II | Project support and group discussion |
| 10/5/16 | CAM system and operation IV | Ainsworth 202 | Other processes, redesign and optimise processing time and costs | Project support and group discussion |
| 17/5/16 | CAD/CAM/CAE in practice | Ainsworth 202 | Applications for CAD, CAM and CAE | Project support and group discussion |
| 24/5/16 | Assignment 2 presentation | Ainsworth 202 | Assignment 2 presentation | Assignment 2 presentation |
| 31/5/16 | CAD/CAM future trend | Ainsworth 202 | The future trend for CAD/CAM technologies and applications | Quiz 2 |

# 5. Assessment

**Assessment Overview**

| Assessment | Length | Weight | Learning outcomes assessed | Assessment criteria | Due date and submission requirements | Marks returned |
|---|---|---|---|---|---|---|
| Quiz 1 | 2 hours | 20% | 1, 2 and 3 | All course content from weeks 1-5 inclusive. | During week 6 demonstration class | One week after completion |
| Quiz 2 | 2 hours | 20% | 1, 2, 3 and 4 | All course content from weeks 6-12 inclusive. | During week 13 demonstration class | One week after completion |
| Assignment 1 | 2 CAD drawings | 25% | 1 and 3 | Solidworks skills | 5pm, Friday 8/4/2016 (Week 5), via Moodle | Two weeks after submission |

| | | | | | | |
|---|---|---|---|---|---|---|
| Assignment 2 | 1000 words and CAD/CAM files | 30% | 1, 3 and 4 | Solidworks / SolidCAM skills and written skills | 5pm, Friday 27/5/2016 (Week 12), via Moodle | Three weeks after submission |
| Assignment 2 presentation | 10 minutes | 5% | 4 | Oral presentation skills | During week 12 lecture | Graded on-the-spot |

In order to achieve a PASS (PS) in this course, you need to achieve a composite mark of at least 50. Note that a 'double-pass' is not required for this course.

Instruction for the group project may be found on the course Moodle page, it will be available to students in Week 1.

**Assignments**

*Presentation*

All 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. Presenting them 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 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 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.

**Examinations**

You must be available for all tests and examinations. 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.

# 6. Expected Resources for students

The resources for students enroll in this course will include:
Reference Books:

1. Computer-Aided Design and Manufacture – Prepared by Khoi Hoang for UNSW - MacGraw-Hill Custom Publishing, 2011 – ISBN-101-12-106812-X
2. Systems Approach to Computer-Integrated Design and Manufacturing by Nanua Singh, John Wiley & Sons, Inc., 1996.
3. Computer-Integrated Design and Manufacturing by David D. Bedworth et alliances, MacGraw-Hill International, 1991.

Additional lecture notes and materials will be given via Moodle.

If you wish to explore any of the lecture topics in more depth, then other resources are available and assistance may be obtained from the UNSW Library website:
http://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 more demonstrator support to the student major group project. The increase number of demonstrators in this semester also means that grading can be done more efficiently, and students will be expected to receive their feedbacks sooner after submission.

# 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: 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.

# 9. Administrative Matters

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

*Ronald Chan & Erik van Voorthuysen*
*Feb 2016*

# 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 |