UNSW AUSTRALIA

Course Outline

Semester 1, 2015

Never Stand Still | Faculty of Engineering | School of Mechanical and Manufacturing Engineering

MANF9543

COMPUTER AIDED DESIGN & MANUFACTURE

Contents

COURSE OUTLINE

MANF9543 COMPUTER AIDED DESIGN & MANUFACTURE

1. STAFF CONTACT DETAILS

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Contact details and consultation times for course convenor

Dr Erik van Voorthuysen
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Consultation concerning this course for Dr Ibbotson is available on Wednesday from 12:00-2:00pm during week 1-6 and 10:00am-12:00pm during week 7-13 as well as during the class. Direct consultation is preferred; Email can be used outside of the specified time above.

Contact details and consultation times for additional lecturers/tutors

Will be given in class.

2. COURSE DETAILS

More information is presented in a table on page 9. Lectures and tutorials are held at Tyree Energy Technologies Building (TETB) H6, room G16.

- **Week 1** **Lecture:** Wednesday 18:00-20:00pm (*No tutorial in week 1).*
- **Week 2-6** **Lecture:** Wednesday 14:00-16:00pm
  Note: Week 3-5 Laboratory tour: Wednesday 15:00-16:00pm in Willis Annexe J18

- **Week 2-5** **CAD tutorial:** Wednesday 18:00-20:00pm (*No tutorial in week 6).*
- **Week 7-13** **Lecture:** Wednesday 12:30-14:00pm.
  CAM tutorial and group discussion: 14:00-16:00pm (*No tutorial in week 13)*
  Note: Room G16 is also booked during 18:00-20:00pm for additional lecture, tutorial or self-study if required.

Credit Points:

This is a 6 unit-of-credit (UoC) course, and involves 2 hours per week (h/w) of lecture and 2 h/w of tutorial.

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.”

For a standard 24 UoC in the semester, this means 600 hours, spread over an effective 15 weeks of the semester (thirteen weeks plus stuvac plus one effective exam week), or 40 hours per week, for an average student aiming for a credit grade. Various factors, such as your own ability, your target grade, etc., will influence the time needed in your case.

Some students spend much more than 40 h/w, but you should aim for not less than 40 h/w on coursework for 24 UoC.

This means that you should aim to spend not less than about 10 h/w on this course, i.e. an additional 6 h/w of your own time. This should be spent in making sure that you understand the lecture material, completing the set assignments, further reading about the course material, and revising and learning for the examination.

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 both 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, applying strength analyses.

Aims of the Course

1. This course will enable students to explore and gain further understanding of how the computers can be used in Manufacturing Industry.
2. ***This course will also provide students with opportunity to explore the innovation in design the product using*** both SolidWorks and SolidCAM software***.***

Student learning outcomes

At the conclusion of this course the student will be able to:

1. Apply the design concepts for any design task in CAD/CAM environment.
2. Apply the best use of Computer Aided Manufacture techniques in a modern factory.
3. Create a concept of CAD/CAM application for the Rapid Prototyping Technology
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.

Graduate Attributes

UNSW's graduate attributes are shown at
https://my.unsw.edu.au/student/atoz/GraduateAttributes.html

UNSW aspires to develop graduates who are rigorous scholars, capable of leadership and professional practice in a global community. The university has, thus, articulated the following Graduate Attributes as desired learning outcomes for ALL UNSW students.
UNSW graduates will be

1. Scholars who are:
   - (a) understanding of their discipline in its interdisciplinary context ✓
   - (b) capable of independent and collaborative enquiry ✓
   - (c) rigorous in their analysis, critique, and reflection
   - (d) able to apply their knowledge and skills to solving problems ✓
   - (e) ethical practitioners
   - (f) capable of effective communication ✓
   - (g) information literate ✓
   - (h) digitally literate

2. Leaders who are:
   - (a) enterprising, innovative and creative
   - (b) capable of initiating as well as embracing change

(c) collaborative team workers ✓

3. Professionals who are:
   (a) capable of independent, self-directed practice
   (b) capable of lifelong learning
   (c) capable of operating within an agreed Code of Practice

4. Global Citizens who are:
   (a) capable of applying their discipline in local, national and international contexts ✓
   (b) culturally aware and capable of respecting diversity and acting in socially just/responsible ways
   (c) capable of environmental responsibility

   ✓ = Developed in this course

In this course, you will be encouraged to develop the ticked graduate attributes by undertaking the selected activities and knowledge content. These attributes will be assessed within the prescribed assessment tasks, as shown in the assessment table below.

You will be supported in developing the above attributes through:
(i) the design of academic programs;
(ii) course planning and documentation;
(iii) learning and teaching strategies; and
(iv) assessment strategies.

3. RATIONALE FOR THE INCLUSION OF CONTENT AND TEACHING APPROACH

This course is included to enable students to develop particular communications skills that will enhance their practice as a CAD/CAM practitioner. It reflects the lecturer's position that their practice within the field will require advanced levels of communication to enable ongoing development of CAD/CAM today and beyond.

Effective learning is supported when you are actively engaged in the learning process and by a climate of enquiry, and these are both an integral part of the lectures and tutorials.

You become more engaged in the learning process if you can see the relevance of your studies to professional, disciplinary and/or personal contexts, and the relevance is shown in the lectures and assignments by way of examples drawn from industry.

Dialogue is encouraged between you, others in the class and the lecturer. Diversity of experiences is acknowledged, as some students in each class have prior marine experience. Your experiences are drawn on to illustrate various aspects, and this helps to increase motivation and engagement.

It is expected that assignments will be marked and handed back in the week following submission. You will have feedback and discussion while fresh in your mind to improve the learning experience.

4. 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 (3 lectures); CAM (6 lectures) and CAD/CAM and beyond (2 lectures). In addition, there will be two lectures reserved for application of CAD/CAM/CAE by a guest speaker, thus makes the 13-week semester
2. Assignment 1 and Test 1 are assigned to prompt students in applying engineering design and CAD. Assignment 2 which is a group assignment with an individual submission and Test 2 enable the students to be exposed to the real world situation by applying CAD and CAM to produce an actual workpiece. Tutorials and helps will be provided during the course of completing this project. The group tutorials are arranged on a one-to-one basis with the lecturer and tutors to develop the innovation aspects of the design process.

5. ASSESSMENT

In this subject there will be: Assignment 1 (25%), Test 1 (25%), Assignment 2 (35%) and Test 2 (15%) as shown in the table on page 7.

For assignment 1, students will submit their CAD model via Moodle where 5 minute presentation is required individually. In the group assignment (assignment 2), marks will be given to the individual report, not given as a group marks. In the hand-out of the assignment, the assessment criteria, marks assigned to each task, the due date, and late submission penalty will be clearly specified. **These details will be explained in class and via Moodle prior to the students to start the assignment.**

In this subject, the students are expected to attend all the lectures and tutorials, and be active in contributing to the class discussions.

Assessment task	Weight	Due date and submission
Assignment 1	25%	Wednesday week 5 (1 April 2015): • By 1pm submit THREE files: 1) one 3D model; 2) one drawing file using SolidWorks and 3) a PDF file of the technical drawing file into Moodle submission • At 2pm submit an A4 paper of the PDF technical drawing to the lecturer in the lecture room.
Test 1	25%	Wednesday week 6 (15 April 2015): A 1.5-2 hour test during 2-4pm
Assignment 2	35%	Wednesday week 12 (27 May 2015): • By 12pm (noon) on files for a report, CAD and CAM files are required to be submitted via Moodle. • At 12:30pm submit a printed report to the lecturer in the lecture room. • During 1:30-4:00pm a group presentation is given by the students.
Test 2	15%	Wednesday week 13 (3 June 2015): A 1.5-2 hour test during 2-4pm

Assignments

Presentation

All submissions should have a standard School cover sheet which is available from the School website and this subject's Moodle page. All submissions are expected to be neat, and clearly set out. All calculations should be shown as, in the event of incorrect answers, marks are awarded for method and understanding.

The preferred set-out of any numerical calculation is similar to the following:

$A_{bow} = 0.0035AmfV$ (Equation in symbols)
$= 0.0035 \times 480 \times 0.95 \times 1.0 \times 18.00$ (Numbers substituted)
$= 28.7\ m^2$ (Answer with units)

Submission

In the hand-out of the assignment, the late submission penalty will be clearly specified. 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

In the hand-out of the assignment, the assessment criteria and marks assigned to each task, will be clearly specified.

Examinations

No final examination.

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. ACADEMIC HONESTY AND PLAGIARISM

Plagiarism is using the words or ideas of others and presenting them 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 booklet which provides essential information for avoiding plagiarism: https://my.unsw.edu.au/student/academiclife/Plagiarism.pdf

There is a range of resources to support students to avoid 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. Information is available on the dedicated website Plagiarism and Academic Integrity website: http://www.lc.unsw.edu.au/plagiarism/index.html

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 a 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.

7. COURSE SCHEDULE

Date	Week	Topics (Location: Room G16 in Tyree Energy Technologies building, TETB H6)
4/3	1	**6:00-8:00pm: Lecture: Introduction to CAD/CAM** Including course overview, group discussion and distribution of SolidWorks software
11/3	2	**2:00-4:00pm: Lecture: CAD and Engineering design** and distribute assignment 1 6:00-8:00pm: CAD tutorial I: Introduction to SolidWorks
18/3	*3*	**2:00-3:00pm: Lecture: CAD system, Group Technology, case studies** *3:00-4:00pm: Laboratory tour (Group 1)* 6:00-8:00pm: CAD tutorial II: Part design and assemblies
25/3	4	**2:00-3:00pm: Lecture: CAD in practice (Guest speaker: Dr Helmut Mayer)** *3:00-4:00pm: Laboratory tour (Group 2)* 6:00-8:00pm: CAD tutorial III: Engineering drawing
1/4	5	***1:00pm: Assignment 1 submission (25%)*** **2:00-3:00pm: Lecture: Introduction to CAM** *3:00-4:00pm: Laboratory tour (Group 3)* 6:00-8:00pm: CAD tutorial IV: Rendering and animation
8/4	-	**Session Break (3 – 12 April)**

15/4	6	2:00-2:00 pm: **Self study** **2:00-4:00pm: Lecture: Design for Manufacturing and manufacturing processes** ***6:00-8:00pm: Test 1 (25%)***
22/4	7	**12:30-2:00pm: CAM system and operation I (Overview)** 2:00-4:00pm: Group assignment 2 distribution and tutorial for SolidCAM
29/4	8	**12:30-1:30pm: CAM system and operation II (Milling I and Fits and tolerances)** 1:30-4:00pm: Tutorial and group discussion
6/5	9	**12:30-2:00pm: CAM system and operation III (Milling II)** 2:00-4:00pm: Tutorial and group discussion
13/5	10	**12:30-4:00pm: CAM system and operation IV (Other processes, redesign and optimise processing time and costs)** 2:00-4:00pm: Tutorial and group discussion
20/5	11	**12:30-2:00pm: CAD/CAM/CAE in practice (Guest speaker)** 2:00-4:00pm: Tutorial and group discussion
27/5	12	***12:00pm: Assignment 2 submission (35%)*** **12:30-1:30pm: CAD/CAM and Additive Manufacturing (Rapid prototyping)** 1:30-4:00pm: Assignment 2 presentation
3/6	13	**12:30-2:00pm: Lecture: CAD/CAM Future trend** ***2:00-4:00pm: Test 2 (15%)***

8. EXPECTED RESOURCES FOR STUDENTS

The resources for students enroll in this subject will include:

1. Ref book:
   i. Computer-Aided Design and Manufacture – Prepared by Khoi Hoang for UNSW - MacGraw-Hill Custom Publishing, 2011 – ISBN-10 1-12-106812-X
   ii. Systems Approach to Computer-Integrated Design and Manufacturing by Nanua Singh, John Wiley & Sons, Inc., 1996.
   iii. Computer-Integrated Design and Manufacturing by David D. Bedworth et alliances, MacGraw-Hill International, 1991.
2. Additional lecture notes and materials given in class 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

9. 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 tutorial 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: adjusting CAD module focusing on the engineering design application; increasing CAM module; assignment changing CAD/CAM software to facilitate students to work outside the computer laboratory; a clear guideline for assignments and dates for the submissions of assignments and tests.

10. 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/S1-2015_Admin-Matters.pdf

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

Suphunnika Ibbotson and Erik van Voorthuysen
February 2015