UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Semester 1 2018

MANF4100

DESIGN AND ANALYSIS OF PRODUCT-PROCESS SYSTEMS

Contents

1. Staff contact details

Contact details and consultation times for course convenor

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

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 3 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	11am – 2pm	TETB LG05

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 teaches students 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 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 SolidWorks, SolidCAM and the Denford CAM software.

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 and apply systematic design principles as part of designing manufacturing systems and factories.	PE1.1, PE1.5, PE1.6
2.	Use appropriate analytical techniques, including Linear Programming to plan, specify and design a manufacturing system or, for that matter, a business process.	PE1.1, PE2.2, PE2.3

3.	Understand data and information flow within a factory system and how this affects decision making, efficiency and effectiveness of the manufacturing operation.	PE1.1, PE1.2, PE2.1
4.	Understand, implement and manage key manufacturing improvement strategies including lean manufacturing.	PE2.4, PE3.2, PE3.3

4. Teaching strategies

Lectures in the course are designed to cover the terminology and core concepts and theories in the area of manufacturing process design. They do not simply reiterate the texts, but build on the lecture topics using examples taken directly from industry to show how the theory is applied in practice and the details of when, where and how it should be applied. The first assignment prompts students in applying engineering design using CAD. The second assignment is a group assignment with an individual submission that exposes students to the real-world situation by applying CAD and CAM to produce a commercial product. Demonstrations will be provided during the course of completing this project. The group demonstrations are arranged to provide teams with personalised feedback.

5. Course schedule

Date	Topic	Lecture Content
26/02/17 (Week 1)	Introduction to Product-Process Systems	• Global Manufacturing Issues • Comparison of Manufacturing Sectors • Competitive Strategy • Push – Pull Systems • Volume – Variety • Productivity – Flexibility • Global – Local Manufacturing • Product-Process Matrix • Production Process Strategies
05/03/17 (Week 2)	Key Process Drivers for Successful Process	• Flexibility • Reliability • Agility • Scalability • Economic Factors • Sustainable Manufacturing • Line Balancing
12/03/17 (Week 3)	Process Design and Analysis	• Time Horizon in Capacity Planning • Design – Effective Capacity, Capacity Utilisation and Efficiency • Analysis of Flow and Throughput Rate • Bottleneck Analysis and the Theory of Constraints • Breakeven Analysis, Cost-Volume Analysis
19/03/17 (Week 4)	Forecasting Techniques	• Forecasting Time Horizons • Types of Forecasts • The Forecasting Process • Time Series Forecasting • Moving Average • Exponential Smoothing

Date	Topic	Lecture Content
		• Measuring Forecasting Error • Trend Adjustment • Seasonal Variation • Regression Analysis
26/03/17 (Week 5)	Factory Layout Planning & Factory Location Selection	• Strategic Importance of Layout Decisions • Types of Layout • Process Layout Cost Calculation • Product Layout • The Economics of Transportation • Factor Rating Method • Centre of Gravity Method
09/04/17 (Week 6)	Human Factors and Job Design	• Labour Planning • Job Design • Ergonomics • Statistical Methods Analysis and Time Studies
16/04/17 (Week 7)	Resource Allocation – Linear Programming 1	• Formulating an LP problem • Simplex Method • Geometry of the Simplex Method • Using Microsoft Excel Solver
23/04/17 (Week 8)	Transportation Models	• Formulating a Transportation problem • Northwest Corner Method
30/04/17 (Week 9)	Aggregate Planning and Production Scheduling	• Sales and Operations Planning • Aggregate Planning Methods • Master production schedule • Level Production
07/05/17 (Week 10)	Materials Requirements Planning	• Material requirements planning • Enterprise resource planning • MRP explosion • Order quantities analysis • Lean production
14/05/17 (Week 11)	Project Presentation	• Project Presentation
21/05/17 (Week 12)	Exam Revision	• Exam Revision

6. Assessment

Assessment overview

Assessment	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Online Quiz x 3	1 hour	15% in total (5% each)	1, 2 and 3	Lecture content (Progressive)	1pm-2pm, Monday, Week 3 (12/03), Week 6 (26/03), Week 9 (04/30)	Immediately after the quiz is closed on Moodle	Immediately after the quiz is closed on Moodle
Group Project Progress Review x 2	10 minutes video	20% in total (10% each)	1, 2, 3 and 4	Completeness, originality, level of details, project management and report writing skills	5pm, Friday, Week 4 (23/03) and 9 (04/05) via Moodle	1 week after due date	2 weeks after submission
Group Project	20 pages, single sided, min. font size 11	30%	1, 2, 3 and 4	Completeness, originality, level of details, project management, oral presentation and report writing skills	5pm, Friday, Week 13 (01/06) via Moodle	1 week after due date	2 weeks after submission
Final exam	2 hours	35%	1, 2 and 3	All course content from weeks 1-12 inclusive.	Exam period, date TBC	N/A	Upon release of final results

Assignments

Presentation

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 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

You must be available for all tests (quizzes) and examinations. There is no final examination for this course.

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

Reference books (available via UNSW library)

1. Operations Management – Sustainability and Supply Chain Management, J. Heizer and B. Render, 2014, Pearson Education.

E-books (available via UNSW library)

2. Manufacturing Process Selection Handbook: From Design to Manufacture, Swift K.G., Booker J.D., 2013, Burlington, Elsevier Science.
3. Production and Operations Management, S. Anil Kumar and N. Suresh, 2007, New Age International Publishers.

Additional lecture notes and materials will be given via Moodle.

UNSW Library website: https://www.library.unsw.edu.au/
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 more demonstrator support to the student major group project. The School has also purchasing a 4-axis milling router for learning and teaching. Students will be able to see CAD/CAM

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