UNSW AUSTRALIA

Course Outline

Semester 1 2016

Never Stand Still | Engineering | Mechanical and Manufacturing Engineering

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

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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.

2. 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.

There is no parallel teaching in this course.

Contact Hours

	Day	**Time**	**Location**
Lectures	Monday	1pm - 4pm	Ainsworth G02

Summary of the Course

Key factors for success in modern manufacturing include quality, productivity, efficiency, flexibility, agility, and customer satisfaction all while maintaining control over cost. Depending on the characteristics of the product and its market, an appropriate manufacturing system needs to be designed, integrating appropriate manufacturing processes, machinery, automation, materials handling and management systems. This course is closely aligned with the characteristics and requirements of small to medium scale manufacturing, entrepreneurial start-ups and prototyping.

MANF4100 integrates the theory and knowledge gained from MANF3100 Product and Manufacturing Design and MANF3510 Process Technology and Automation into the theory and practice of designing and analysing automated and computer integrated manufacturing and product-process systems and facilities. The design of such systems is complex and needs to consider multiple factors and design drivers, including the nature and characteristics of the product, the market, the manufacturing breadth and scope of the organisation, the appropriate level of manufacturing flexibility, manufacturing and materials handling technology as well as demographic characteristics such as workforce skills, labour rates and environmental factors. The performance of such systems needs to be understood in the early stages of concurrent product-process design and continuously adapted and improved as the needs and requirements change throughout the product (and process) life cycle.

The course is focused on design as well as analysis. It covers essential analytical techniques involved in understanding and planning manufacturing requirements and translating these into feasible manufacturing system design alternatives. The course requires a solid prior understanding of product design for manufacturing as well as automation technology.

Topics include:

- Different types of Product-Process systems and their application
- Technical and economic factors in designing flexible, modular and scalable systems
- Manufacturing strategies and ongoing improvement strategies and methodologies
- Capacity planning
- Factory layout design
- Factory location planning
- Inventory management, production planning and scheduling
- Human factors

The course will combine lectures with practical case studies that require the theory taught to be applied to actual manufacturing systems.

Aims of the Course

The course aims to develop you into a skilled and all-rounded process, manufacturing, factory and industrial design engineer able to carry out and manage the key design processes in parallel and concurrently. Design is inherently complex and a systematic, yet flexible, agile and interdisciplinary approach is required to bring product to the market

successfully and in less time, using appropriate technology and operations management. The course teaches this approach, at the manufacturing system and factory level, based on global best-practice methodologies, industry lecturers, and incorporates case studies and projects, to apply these methodologies and become proficient at them.

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.	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 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

3. 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.

This course will be presented using PowerPoint presentations as well as case studies and real-life designs. The material will be presented in the lecture and the student is expected to actively participate in discussion, analysis and design. Assignments to develop the understanding of the key methodologies and theories and how to apply them will be provided as part of the course. There will be quizzes to support the learning experience, and in addition, there will be a final exam.

4. Course schedule

Date	Topic	Location	Lecture Content	Suggested Readings
29/2/16	Introduction to Product-Process Systems	Ainsworth G02	Basic terms and definitions	Chapter 5. Designing operations and Chapter 6. Quality management and international standards
7/3/16	Flexible, Reliable, Agile, Scalable, Economical and Sustainable Manufacturing	Ainsworth G02	State-of-the-art manufacturing concepts	Lecture notes
14/3/16	Process Design and Analysis	Ainsworth G02	Tools and strategies for process design and analysis	Chapter 7. Process Design
21/3/16	Capacity Planning	Ainsworth G02	Capacity analysis and assessment	Supplement 7. Capacity planning
4/4/16	Layout Planning	Ainsworth G02	Plant layout selection and assessment	Chapter 9. Layout decisions
11/4/16	Factory Location Planning	Ainsworth G02	Plant location selection and assessment	Chapter 8. Location decisions
18/4/16	Human Factors and Job Design	Ainsworth G02	Human resources management	Chapter 10. Job design and work measurement
2/5/16	Inventory Management	Ainsworth G02	Tools and analysis for inventory management	Chapter 12. Managing inventory
9/5/16	Aggregate Planning and Production Scheduling	Ainsworth G02	Planning strategies and scheduling methodologies	Chapter 13. Aggregate scheduling
16/5/16	Materials Requirements Planning	Ainsworth G02	Material requirements planning structure and analysis	Chapter 14. Material requirements planning (MRP) and ERP

23/5/16	Supply Chain Management	Ainsworth G02	Supply chain management concept and integration to product-process systems	Chapter 11. Managing operations
30/5/16	Manufacturing Strategies	Ainsworth G02	Lean manufacturing and Six Sigma	Chapter 16. JIT, lean operations and the Toyota production system

5. Assessment

Assessment Overview

Assessment	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Marks returned
Quiz 1	Short answer questions	15%	1, 2 and 3	All course content from weeks 1-3 inclusive.	21/3/2016 lecture time	2 weeks after the quiz
Quiz 2	Short answer questions	15%	1, 2 and 3	All course content from weeks 4-9 inclusive.	9/5/2016 lecture time	2 weeks after the quiz
Group project progress review 1	10 minutes presentation	5%	1, 2, 3 and 4	Completeness, originality and oral presentation skills	4/4/2016 lecture time	Graded on-the-spot
Group project progress review 2	10 minutes presentation	5%	1, 2, 3 and 4	Completeness, originality and oral presentation skills	2/5/2016 lecture time	Graded on-the-spot
Group project	3500 words	30%	1, 2, 3 and 4	Completeness, originality and report writing skills	5pm 3/6/2016 via Moodle	Upon release of final results
Final exam	2 hours	30%	1, 2 and 3	All course content from weeks 1-12 inclusive.	Exam period, date TBC	Upon release of final results

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

Group forming

By Friday of Week 2, at 5pm, you will need to self-enroll into a group on Moodle. Each group is set to consist of two or three members. Instruction to the self-enroll system can be found on Moodle in Week 1. Please note that any students who are not enrolled in a group by Friday of Week 2, at 5pm, they will be automatically assigned to a new group.

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. Final examinations for each course are held during the University examination periods, which are June for Semester 1 and November for Semester 2.

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.

6. 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.

You may access the UNSW library website via:
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 providing more regular feedbacks to students regarding the major group project. Two mandatory progress reviews will take place in Week 5 and 9 for staffs to provide guidance and feedback to groups.

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