



Course Outline

Semester 1, 2015

MANF4100

**DESIGN AND ANALYSIS OF
PRODUCT-PROCESS SYSTEMS**

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MANF4100 DESIGN AND ANALYSIS OF PRODUCT-PROCESS SYSTEMS

COURSE OUTLINE

I. STAFF CONTACT

Course coordinator: Erik van Voorthuysen
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Teaching staff: Ron Chan, Erik van Voorthuysen

Consultation concerning this course is available immediately after the classes. Direct consultation is preferred.

2.

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

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

At the conclusion of the course it is expected that you will be able to:

- 1) Understand and apply systematic design principles as part of designing manufacturing systems and factories.
- 2) Use appropriate analytical techniques to plan, specify and design a manufacturing system or, for that matter, a business process.
- 3) Integrate major machine elements and materials handling, learnt in MANF3510, into a manufacturing system.
- 4) Understand data and information flow within a factory system and how this

6. capable of effective communication
7. information literate
8. digitally literate

Leaders who are:

9. enterprising, innovative and creative
10. capable of initiating as well as embracing change
11. collaborative team workers

Professionals who are:

12. capable of independent, self-directed practice
13. capable of lifelong learning
14. capable of operating within an agreed Code of Practice

Global Citizens who are:

15. capable of applying their discipline in local, national and international contexts
16. culturally aware and capable of respecting diversity and acting in socially just/responsible ways
17. capable of environmental responsibility

A statement of broad graduate attributes has meaning when expressed in the context of the discipline. The graduate attributes contextualised for engineering are shown at: <http://teaching.unsw.edu.au/sites/default/files/upload-files/GradAttrEng.pdf>

In this course, you will be encouraged to develop these Graduate Attributes, and more specifically 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15 and 17 by undertaking the selected activities and knowledge content. These attributes will be assessed within the prescribed assessment tasks, as shown in the assessment table on Page 7.

3.

This course is included to build on knowledge gained from core courses undertaken in mechanical engineering design, as well as MANF3100 Product and Manufacturing Design and MANF3510 Process Technology and Automation, by developing the ability and skills to design a manufacturing system or business process. Mechanical engineering design is rarely done in isolation, rather it is done concurrently with other key processes including design for manufacturing, quality management, operations and costing and so on. This course focuses specifically on analysis and design of factory systems. In combination with mechanical and manufacturing engineering courses, the knowledge and capabilities gained from this course will allow you to become a skilled and all-rounded design engineer.

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 practica.

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 industriag

Paying attention throughout the lectures/practica

ay of assignments, quizzes, and a final exam. Quizzes
s and descriptive material.

| | |
|----------------------------|--|
| Week 7 Thursday 23 April | (Graduate Attributes: 1, 2, 3 and 4) |
| Week 12 Thursday 28 May | (Graduate Attributes: 1, 2, 3 and 4) |
| Due week 8 Monday 27 April | (Graduate Attributes: 1, 2, 3, 4, 7, 8 and 17) |
| Due week 13 Friday 5 June | (Graduate Attributes: 1, 2, 3, 4, 7 and 8) |

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>

Please note that late penalties are at the discretion of the course convenor and in some cases late work may not be assessed. Please carefully check course outlines

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

7. COURSE SCHEDULE

| Week | Topic | Lecturer |
|------|--|----------|
| 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 | EVV |
| 2 | Flexible, Reliable, Agile, Scalable, Economical and Sustainable Manufacturing Concept of Value Adding Flexible Manufacturing Concepts Computer Integrated Manufacturing Flexible Automation Scalability Concepts Role and Significance of the SME Building Blocks and the Integration of Technologies, Systems, Processes and Skills The Circular Economy Sustainability | EVV |
| 3 | Process Design and Analysis Flowchart, Flow Units Time-Function Mapping Value Stream Mapping Process Chart Service Process Mapping The Four Process Strategies Process Equipment Selection Productivity Measurement Overall Equipment Efficiency | RC |
| 4 | Capacity Planning Time Horizon in Capacity Planning Design Effective Capacity, Capacity Utilisation and Efficiency | |

| | | |
|---|---|----|
| 5 | Layout Planning Strategic Importance of Layout Decisions Types of Layout Process Layout Cost Calculation Product Layout Cellular Manufacturing and the Manufacturing Cell Group Technology Line Balancing | RC |
| 6 | Factory Location Planning Global-National-Regional-Local Demand and Manufacturing Global Competitiveness Global Risk The Economics of Transportation Factor Rating Method Centre of Gravity Method Transportation Modeling | RC |
| 7 | Human Factors and Job Design Labour Planning Job Design Team Work Ergonomics Work Environment Methods Analysis and Time Studies Ethics | RC |
| 8 | Inventory Management Types of Inventory ABC Analysis Independent Dependent Demand Economic Order Quantity Model Production Order Quantity Model Quantity Discount Model Probabilistic Models Single Multiple Period Models | RC |

| | | |
|----|--|-----|
| 10 | Materials Requirements Planning Bills of Materials MRP Structure Lot Sizing Material Resource Planning, MRPII | EVV |
| 11 | Supply Chain Management Supply Chain Activities Sourcing Issues and Strategies Supply Chain Risk Managing the Integrated Supply Chain Logistics Management Distribution Management Measuring Supply Chain Performance | RC |
| 12 | Manufacturing Strategies Lean Manufacturing Six Sigma TQM Just-in-Time Reliable-Flexible Supply (RFS) Toyota Production System Agile Manufacturing Modular and Reconfigurable Manufacturing Systems Maintenance, Reliability, RCM, TPM | RC |

Please note that the some of the topics may run over the indicated period if there are questions and the discussions are long.

8. RELEVANT RESOURCES FOR STUDENTS ENROLLED IN THE COURSE

Textbooks:

No formal textbook is required at this time. Lecture notes will be available on Moodle.

Reference books:

1. Operations Management Sustainability and Supply Chain Management, J. Heizer and B. Render, 2014, Pearson Education. This textbook is available through the bookstore at UNSW.

