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MMAN4400 ENGINEERING MANAGEMENT

1. STAFF CONTACT DETAILS:

Academic in charge: Erik van Voorthuysen, Willis M3, 93854147, erikv@unsw.edu.au

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

Face to face tutorials will be run by Mr Ron Chan, Dr Jason Held and EvV. Additional tutors will support the class and they will be introduced in Week 2.

2. COURSE DETAILS

Lecture Times and Locations
   Monday 0900-1200 Science Theatre
   Thursday 1600-1800 OMB 112 and 149

Units of credit

This is a 6 unit-of-credit (UoC) course, and involves 5 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.”

For a standard 24 UoC in the session, this means 600 hours, spread over an effective 15 weeks of the session (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 7 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.

There is no parallel teaching in this course
Course Overview

MMAN4400 Engineering Management presents four subject areas, considered to be critical in terms of managing and leading engineering operations. They are:

- Investment analysis and engineering economy
- Costing and operations analysis
- Quality management, including design
- Project management

Within each subject area the course will cover many conceptual and analytical techniques, all supporting fact- and data-based analysis and decision making with the aim of improved product and process performance, economy and sustainability. The course consists of lectures, tutorials and assignment work. There will be two mid-term quizzes and a major case study. There will be no final exam.

Considering the diverse nature of subject areas, there really is no single, suitable textbook available that covers all these areas and therefore a custom textbook, consisting of a compilation of outstanding chapters from three different textbooks has been created with the assistance of the McGraw-Hill company. Our campus bookstore will have this book for you to purchase. It is important you do so, as this book will be an excellent reference for you for years to come. Additional lecture notes are also posted on Blackboard.

Aims of the course

This course is designed to help you to learn how to manage the operations in organisations and also to build a business or commercial case for making engineering related decisions, such as investment in plant, equipment and processes. Although the main emphasis will be on product and process, consideration will also be given to designing engineering services. The course offers a broad managerial perspective emphasising the strategic impact of operations decisions and the interfaces between operations and the other functional areas of organisations, including of course, finance.

This course encompasses the key elements of operations management and investment analysis and pulls them together in a coherent format that allows you to understand the 'big picture' as well as 'the specific details'. It is aimed at integrating the knowledge gained from the different engineering subjects you have studied into a framework and process that allows you to implement your solutions and ideas in a commercial environment.

Engineers have traditionally played an important role in management, largely because design and technology were the main key factors for success in product and process design, but also the fact that our engineering degree gave us outstanding analytical skills to solve a multitude of problems. This really hasn’t changed, but in an increasingly complex world, successful organizations – public, private or governmental – need managers with increasingly broad and diverse skills, especially in finance, law, risk and quality management, and customer relations. And more to the point, organizations need leaders at every level, with the ability to make carefully considered and innovative long-term strategic decisions. It is the purpose of MMAN4400 to equip you with enough knowledge and information to become a global manager, indeed a leader, with the ability to apply analytical methods and quality processes to create short and long term value for your organization, your customers, and the community, in other words, all stakeholders.

Some of you will follow a ‘traditional’ engineering career, whereas others will branch out into
very different fields, including consulting, banking, insurance, service industries, transport and so on. It is the aim of this course to prepare you for any of these, and to train your mind to think strategically and systematically, integrating technical, commercial, financial and managerial concepts. We will also have some guest lecturers from industry and the professions. They will speak on a range of current and important issues, and be happy to engage you in discussion.

The textbooks, notes, case studies and UNSW Blackboard postings support the lectures and tutorials but they are not intended to be a substitute for attending classes. You are expected to cover all the materials assigned for both lectures and tutorials.

**Student learning outcomes**

The specific learning outcomes for the course include:

- State what an organisation needs to do to remain competitive in today’s environment.
- Be able to model and understand a process and its flows
- Perform investment and feasibility analyses
- Be able to design cost models
- State how an organisation can improve its processes and integrate its several functions through the best use of quality engineering.
- Be able to distinguish between several frameworks, methods, tools and to apply the appropriate ones in practical cases
- Be able to determine whether a process is capable of producing a product or service to specifications
- Be able to integrate important strategies like total quality management, Six-Sigma, and Benchmarking into organizations.
- To be able to understand the advantages and limitations of operations planning and control systems such as materials requirements planning (MRP), project scheduling, inventory management, logistics etc.
- To be able to critically evaluate and apply important new operations and manufacturing management approaches such as Just-in-Time, Lean Manufacturing, Business process re-engineering, Concurrent engineering, Design for X etc.
- To be able to understand the role that the operations management function plays in international business and how the operations function can play a strategic role in improving the global competitiveness of the organisation.

**Graduate attributes**

UNSW’s graduate attributes are shown at –
[https://my.unsw.edu.au/student/atoz/GraduateAttributes.html](https://my.unsw.edu.au/student/atoz/GraduateAttributes.html)

and are stated as:

**Scholars who are:**

1. understanding of their discipline in its interdisciplinary context
2. capable of independent and collaborative enquiry
3. rigorous in their analysis, critique, and reflection
4. able to apply their knowledge and skills to solving problems
5. ethical practitioners
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:


In this course, you will be encouraged to develop Graduate Attributes 1, 2, 3, 4, 5, 6, 7, 8, 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. RATIONALE FOR INCLUSION OF CONTENT AND TEACHING APPROACH

Today’s organizations are evermore focused on improving performance. Key to this improvement is high quality engineering management. It has moved from beyond an emphasis on management of quality to a focus on the quality of managing, operating and integrating the design, manufacturing, delivery, marketing, information, customer service and financial areas throughout an organisation’s value chain.

Therefore, a wide variety of concepts and tools of analysis will be covered and you will be interacting with other students in the lectures and tutorials, either online or face-to-face, sometimes in teams or individually. 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, face-to-face and web-based tutorials by way of examples drawn from different industries.

Several case discussions will take place in lectures and face-to-face tutorials as well as through UNSW Blackboard. These aim to give several opportunities to each of you to interact, exchange ideas, knowledge and experiences with the facilitators and other students through:

- Reading from a wide range of cases studies and synthesise a range of perspectives,
- Reflecting on your own experience and knowledge in the light of new learning,
- Exchanging views and challenge each other’s thinking in structured learning environment,
- Analyzing case studies and relate learnings to your own context working collaboratively on a hypothetical project.
4. TEACHING STRATEGIES AND THEIR RATIONALE

Lectures, tutorials and assessments in the course are designed to cover the core knowledge areas in Engineering Management. They do not simply reiterate the texts, but build on the lecture topics using examples and cases 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.

Lectures and Tutorials are designed to develop several graduate attributes by creating an environment where information sharing, discussions, teamwork, communication, task completions and project role playing will take place. Since each of you may have come from a different engineering stream, your experiences are drawn on to illustrate various aspects of cases covered, and this helps to increase motivation and engagement.

Suggested approaches to learning in the course

Suggested approaches to learning in this course include:
- Careful reading, discussion and understanding of the material presented in lectures.
- Additional reading on and about the material presented in lectures to broaden the knowledge base.
- Paying attention throughout the lectures/tutorials, and asking questions when anything is not understood.
- Conscientiously working through the set tutorials.
- Learning of the lecture material in preparation for examinations.

Student-centred and self-directed learning (expectations of the students)

This course involves five hours per week of face-to-face contact, and it is expected that you will put in, on average, an additional five-to-six hours per week of your own time (including stuvac and exams). This time should be spent in revising the lecture material and further reading, completing the set assignments, and revising and learning for the examinations.

Expected learning outcomes; their association with the teaching strategies and with the suggested approaches to learning

It is expected that, at the end of this course, you will have learnt how to identify key issues and to design solutions based on data and analysis. You will be able to collect data, analyse the data and draw conclusions associated with the analysis. It is also expected that you will be able to communicate the conclusions in a well-written report and on-line collaborative discussions. It is expected that you will be able to make judgements associated with an appropriate choice of analytical approach for a given engineering management issue, especially considering that there may be more than one correct approach.
5. **ASSESSMENT**

You will be assessed by two quizzes, as well as your continuous participation in completing a major assignment. They may involve calculations, descriptive material and discussions.

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Weight</th>
<th>(Graduate Attributes: 1, 2, 3, 4, 6, 7, 8, 11 and 15)</th>
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<tbody>
<tr>
<td>Assignment (due Week 13)</td>
<td>60%</td>
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<tr>
<td>Quiz (Week 9 &amp; 13)</td>
<td>40%</td>
<td>(Graduate Attributes: 1, 3, 4, and 12)</td>
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**Overall mark for course** 100%

The assessments are based to allow you to obtain an understanding of the material being taught and will allow you to apply the concepts learnt in the course.

In order to achieve a Satisfactory performance in this course, you need to achieve a satisfactory level of performance in all assessments.

The dates for the assignments will be communicated to you in class and provided on Blackboard as the course progresses.

**Quizzes and Examinations**

There will be no Final Examination.

For quizzes, you will need to provide your own calculator, of a make and model approved by UNSW, for the examination. The list of approved calculators is shown at [https://my.unsw.edu.au/student/academiclife/assessment/examinations/Calculator.html](https://my.unsw.edu.au/student/academiclife/assessment/examinations/Calculator.html)

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 quiz.

**Special Consideration and Supplementary Assessment**

For details of applying for special consideration and conditions for the award of supplementary assessment, see *Administrative Matters for All Courses*, available from the School website.
Assignments

Each of you will be assigned to a case study, as part of a team, with a set of questions listed. Links to the case study assignments are given below. Announcement made about due date for presentations will be made on Blackboard. Completed assignments will be handed in hard copy by the end of the week 13. The assignment supports the learning outcomes by incorporating an appropriate mix of activities such as issue analysis, fact based data analysis that support the design of appropriate solutions and strategies. The assignments also support collaborative team work and integration of different ideas and components into a overall coherent engineering management strategy.

Late submissions attract a penalty of 10% per day, unless prior dispensation has been given.

Important Dates

By the end of Week 2, you will need to have formed a team of five or six members – you may choose your own team. Each team member needs to carefully read the “Team Assignment Agreement” which will be posted on Blackboard and fill it in and submit it to your tutors on Thursday of Week 2. You also need to select which cases you would like to work on. We will try our best to assign you to your top preferences but cannot guarantee this – especially if everyone picks the same case. That is why you need to number all the eight cases below in order of preference.

You are expected to discuss your case and its questions with your team members and submit a report at the end of Week 13. In addition, each team will make two presentations. The dates for these presentations will be communicated to you in class. The theme of the first presentation is “problem statement, issue analysis and initial hypotheses” and the theme for the second is “solution strategy, analyses and preliminary results”. It is expected that each team member presents at least once during the session.

The case studies can be purchased directly by clicking on the relevant link. You can read summary information on each case before you decide how to rank-order them. Only purchase the case once you have confirmation from your tutors that you have actually been assigned to that case.


Criteria

The following criteria will be used to grade assignments:
• Analysis and Evaluation of assignments by integrating knowledge gathered in lectures, tutorials and textbook.
• Sentences in clear and plain English—this includes correct grammar, spelling and punctuation
• Correct referencing in accordance with the prescribed citation and style guide
• Appropriateness of analytical techniques used
• Accuracy of numerical answers
• All working shown
• Use of diagrams, where appropriate, to support or illustrate the calculations
• Use of graphs, where appropriate, to support or illustrate the calculations
• Use of tables, where appropriate, to support or shorten the calculations
• Neatness

For presentations, the following criteria will apply:

• Clear slides
• Logical storyline
• Demonstrated understanding of the case
• Analytical, fact based approach
• Comprehensive but concise analyses
• Ability to field questions
• Ability to present within the allocated time slot.

**Face-to-Face Tutorials**

NO submissions for Face-to-Face tutorial exercises are needed since these tutorials aim to support you to understand the concepts and problems covered in the lectures, textbook in greater depth. The list of tutorial exercises will be posted on Blackboard.
6. COURSE SCHEDULE

WEEK 1: Investment, Processes, Systems and Cost Analysis
Chapters 1, 2 and 3

- Operations and Supply Chain Management
- A Process view
- A System view
- Cost models
- Process performance, OEE
- Capital – equipment and inventory
  - Inventory turns
  - Capital velocity
- Labor – direct and indirect
- Investments
  - Different forms
  - Return on investment
- Sustainability – revenue, profit, cost, competitive advantage
- Leadership & Management

WEEK 2: Process Mapping, Costs and the Issue of Variability
Chapters 4, 5 and 6

- Process flow diagram
- Process capacity, utilization, workload
- The problem of Variability
  - Delivery and time
  - Throughput and performance
  - Quality and capability
- Estimating and reducing costs
  - Labour
  - Equipment
  - Inventory

WEEK 3: Design and MRP
Chapter 7

- Product – Process design, V models, axiomatic methods
- Product Process matrix
- QFD
- MRP

WEEK 4: Quality Management
Chapter 8

- Quality Theory: Deming, Taguchi, Juran, Ishikawa,
- 7 old methods, 7 new
- Robust design
- TQM and Quality management techniques

WEEK 5: Engineering Economy 1
Chapters 9, 10, 11 and 16

- Interest rate
- Cost of capital (WACC)
• Simple and compound interest
• Cash Flow diagram
• Nominal vs Effective interest
• Nominal vs Real interest
• Concept of inflation

**WEEK 6: Engineering Economy 2**
Chapters 12, 13, 14 and 15

• Present worth analysis
• Annual worth analysis
• IRR method
• Payback analysis

**WEEK 7: Engineering Economy 3**
Chapters 15, 17 and 18

• Cost benefit analysis
• Breakeven analysis
• Depreciation
• Taxation

**WEEK 8: ROIC and Project Management**
Chapter 19 and 20

• ROIC Tree
• Project Management (Helmut)
• CPM, GANTT

**WEEK 9: Statistical Process Control 1**
Chapter 8

• Process variables

**WEEK 10: Statistical Process Control 2**
Chapter 8

• Process attributes

**WEEK 11: Lean Management**
Chapter 21

• Lean Supply Chain Management

**WEEK 12: Improving Efficiency, Effectiveness, Reliability, Quality**

• JIT, Agile
• Process reengineering
• Process improvement
• Maintenance
• Six Sigma
7. RELEVANT RESOURCES FOR STUDENTS ENROLLED IN THE COURSE

Prescribed textbook

The prescribed textbook for this course is:


It is expected that each of you will purchase your own copy.

Additional materials provided in UNSW Blackboard

8.1 UNSW Blackboard

Blackboard is a software application used at UNSW for online learning and teaching activities. When you log on to your blackboard account you will see a list of all courses for which you are registered and that have Blackboard support.

To view your blackboard you will need to have:

- A username and password (z pass for blackboard) this process is explained in the links below
- A computer with Internet access
- A web Browser installed with Java; JavaScript and cookies enabled in the browser settings, and with the cache set to display a new version of a page every time it is visited.

For further information please refer to the links given below.

Logging on to UNSW Blackboard Learn

Using the following Web address:

https://lms-blackboard.telt.unsw.edu.au

The site will provide the information required for getting you started and will provide you with step by step activities required to set up your accounts and access to the course.

The link below provides the information on how to use Bb9 including video demonstration for all topics included:

http://support.telt.unsw.edu.au/blackboard/content/
8. COURSE EVALUATION AND DEVELOPMENT

Periodically student evaluative feedback on the course is gathered, using among other means, UNSW's Course and Teaching Evaluation and Improvement (CATEI) process. Your feedback is taken seriously, and continual improvements are made to the course based in part on such feedback. Please let me know your suggestions and comments throughout and even after the semester.

In this course, recent improvements resulting from the recent student feedback include the changes in the length, submission procedures and presentation of the major assignments.

9. USE OF CALCULATORS

You will need to provide your own calculator, of a make and model approved by UNSW, for the quizzes. The list of approved calculators is shown at https://my.unsw.edu.au/student/academiclife/assessment/examinations/Calculator.html

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 quizzes.

10. ADMINISTRATIVE MATTERS

Academic honesty (including misconduct, plagiarism)

<table>
<thead>
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<th>What is Plagiarism?</th>
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<td>Plagiarism is the presentation of the thoughts or work of another as one’s own.* Examples include:</td>
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- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, website, Internet, other electronic resource, or another person’s assignment without appropriate acknowledgement;
- paraphrasing another person’s work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:
The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students 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 items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle
† Adapted with kind permission from the University of Melbourne.

This is a serious matter and you must ensure that whatever you submit does not contravene the academic honesty and plagiarism policy of this university and this school


If you do contravene this policy then the actions of the university can be severe to you as a student.

**Additional Information**

Information about each of the following matters is presented in a School handout, *Administrative Matters for All Courses*, available from the School website:

www.mech.unsw.edu.au/information-for/current-students/current-undergrad-students/resources/forms-documents

It is essential that you obtain a copy, read it carefully and become familiar with the information, as it applies to this course and to each of the other courses in which you are enrolled.

**Expectations of students** (including attendance at lectures and tutorials/laboratory classes/seminars; and computer use, for example, in the use of email and online discussion forums)

**Procedures for submission of assignments and the School’s policy concerning late submission**

**Information on relevant Occupational Health and Safety policies and expectations can be found on the following website**: www.ohs.unsw.edu.au

**Examination procedures and advice concerning illness or misadventure**
Student support services

Students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convenor prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the EADU on 9385 4734 (www.studentequity.unsw.edu.au). Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

Erik van Voorthuysen
February 2013