UNSW AUSTRALIA

Course Outline

Semester 1, 2015

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

MMAN4400

Engineering Management

CONTENTS

MMAN4400 ENGINEERING MANAGEMENT

COURSE OUTLINE

1. STAFF CONTACT DETAILS:

Academic in charge: Erik van Voorthuysen
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Consultation concerning this course is available immediately after the classes. Direct consultation or phone is preferred.

Lectures and practica will be run by Mr Ron Chan, Mr Corey Martin and Erik Van Voorthuysen. Additional demonstrators will support the class and they will be introduced in Week 2.

2. COURSE DETAILS

Lecture Times and Locations

Monday 0900-1200 OMB 232 (K-K15-232)
Thursday 1100-1300 OMB 232 (K-K15-232)

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 5 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, practica 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 Moodle.

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 Moodle postings support the lectures and practica 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 practica.

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, 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: http://teaching.unsw.edu.au/sites/default/files/upload-files/GradAttrEng.pdf

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 practica, 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 practica by way of examples drawn from different industries.

Several case discussions will take place in lectures and face-to-face practica as well as through UNSW Moodle. 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, practica 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 Practica 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/practica, and asking questions when anything is not understood.
- Conscientiously working through the set practica.
- 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.

Assignment (due Week 13)	40%	(Graduate Attributes: 1, 2, 3, 4, 6, 7, 8, 11 and 15)
Presentation (Week 11 to 13)	10%	(Graduate Attributes: 1, 2, 3, 4, 7, 8, 11 and 15)
Quiz (Week 9 & 13)	50%	(Graduate Attributes: 1, 3, 4, and 12)
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 Moodle 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://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 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 Moodle. Completed assignments will be handed in as a soft 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.

The School guidelines recommend that late submissions incur a penalty of 10% of the total marks awarded for each calendar day the assignment is late. For example, if you received a mark of 40 out of 50 for an assignment that you handed in 2 days late you would receive a penalty of 8 marks and your mark would be reduced to 32. If the same assignment were handed in 4 days late the mark would be reduced to 24. 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

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 for more detailed information regarding late penalties.

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.

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 Moodle and fill it in and

submit it to you demonstrators 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 a presentation. The representation will be held during practica time between Week 11 to 13. The theme of the presentation should cover "the problem statement, issue analysis, hypotheses, cost model, and recommendations)" It is expected that each team member presents at least once during the presentation

Criteria

The following criteria will be used to grade assignments:

- Analysis and Evaluation of assignments by integrating knowledge gathered in lectures, practica 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, were 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 Practica

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

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 for All Courses, available on the School website.

7. COURSE SCHEDULE

WEEK 1: Investment, Processes, Systems and Cost Analysis (EVV)
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 (CM)
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 (EVV)
Chapter 7

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

WEEK 4: Quality Management (EVV)
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 (RC)
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 (RC)
Chapters 12, 13, 14 and 15

- Present worth analysis
- Annual worth analysis
- IRR method
- Payback analysis

WEEK 7: Engineering Economy 3 (RC)
Chapters 15, 17 and 18

- Cost benefit analysis
- Breakeven analysis
- Depreciation
- Taxation

WEEK 8: ROIC and Project Management (RC)
Chapter 19 and 20

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

WEEK 9: Statistical Process Control (EVV)
Chapter 8

- Process variables
- Process attributes

WEEK 10: Project Management (CM)
Chapter 8

- PERT
- CPM

WEEK 11: Lean Management (CM)
Chapter 21

- Lean Supply Chain Management

WEEK 12: Improving Efficiency, Effectiveness, Reliability, Quality (CM)

- JIT, Agile
- Process reengineering
- Process improvement
- Maintenance
- Six Sigma

8. RELEVANT RESOURCES FOR STUDENTS ENROLLED IN THE COURSE

Prescribed textbook

The prescribed textbook for this course is:

MMAN4400 ENGINEERING MANAGEMENT
McGraw-Hill, 2013. ISBN-13: 978-1-12-179435-1.

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

Additional materials provided in UNSW Moodle

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

To view your Moodle you will need to have:

- A username and password (z pass for Moodle) this process is explained in the links bellow
- 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.

Log on to UNSW Moodle Learn using the following Web address:
http://moodle.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: https://student.unsw.edu.au/moodle

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 practica 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.

This course was evaluated in S1, 2013. Based on this evaluation, we have made some substantial changes to the practica format and assessment. Instead of two presentations there will now be only a single presentation by each group to be held later in the session. This frees up additional practice time to work on problems and to prepare better for quizzes.

10. 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://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 quizzes.

11. ADMINISTRATIVE MATTERS

You are expected to have read and be familiar with Administrative Matters for All Courses, available on the School website. This document contains important information on student responsibilities and support, including special consideration, assessment, health and safety, and student equity and diversity.

Erik van Voorthuysen
February 2014