



# Course Outline

Semester 1, 2015

Never Stand Still

Faculty of Engineering

School of Mechanical and Manufacturing Engineering

## **GSOE9810**

# **PRODUCT AND PROCESS QUALITY IN ENGINEERING**

## CONTENTS

	<b>Page</b>
1. STAFF CONTACT DETAILS	2
2. COURSE DETAILS	2
3. RATIONALE FOR INCLUSION OF CONTENT AND TEACHING APPROACH	4
4. TEACHING STRATEGIES	5
5. ASSESSMENT	6
6. ACADEMIC HONESTY AND PLAGIARISM	9
7. COURSE SCHEDULE	10
8. RELEVANT RESOURCES FOR STUDENTS	12
9. COURSE EVALUATION AND DEVELOPMENT	12
10. USE OF APPROVED CALCULATORS	12
11. ADMINISTRATIVE MATTERS	13

# GSOE9810 PRODUCT AND PROCESS QUALITY IN ENGINEERING

## COURSE OUTLINE

### 1. STAFF CONTACT DETAILS:

**Academic in charge:** Erik van Voorthuysen  
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**Teaching Staff:** Erik van Voorthuysen  
Ron Chan, [ting.chan@unsw.edu.au](mailto:ting.chan@unsw.edu.au)  
Sandra Popovic, online support, email address to be advised

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

Face to face classes will be run by myself and Ron Chan and web-based support will be provided by Sandra Popovic.

### 2. COURSE DETAILS

#### Lecture Times and Locations

##### **Thursday 1800-2100**

Leighton Hall (K-G19-G01) for weeks 1-5 incl.

Mechanical Engineering G03 (K-J17-G03) for weeks 6-13 incl.

#### Units of credit

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.”

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**

This course will introduce you to the cornerstones of creating and sustaining an effective organisation by covering several quality engineering approaches, industrial cases, videos etc. Several topics as well as methods and tools for improved product and process design will be covered which are essential to take organisations into the next generation with significantly improved organisational effectiveness. Managing quality is considered critical in business and organizational governance and this includes all aspects of the engineering discipline, from analysis to design to implementation and improvement. GSOE9810 can therefore be considered an important and logical element of a graduate engineering degree or diploma.

### **Aims of the course**

This course is designed to cover the core concepts and dynamic approaches in quality engineering field. They do not simply reiterate the textbooks, but build on the lecture topics using examples (many taken from several industries) to show you how successfully and unsuccessfully these approaches are applied in practice.

Practica are designed to support your learning process with opportunities for more interaction as well as to enhance individual and team participation through discussion on problems, questions and cases.

The textbooks, notes, case studies and UNSW Blackboard 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**

When you have completed this course, you should be able to answer questions like:

1. State what an organisation needs to do to remain competitive in today's manufacturing environment.
2. Be able to model and understand a process and its flows
3. State how an organisation can improve its processes and integrate its several functions through the best use of quality engineering.
4. Be able to distinguish between several variables, methods, tools and to apply the appropriate ones in practical cases
5. Be able to determine whether a process is capable of producing a product or service to specifications
6. Be able to integrate very popular topics like total quality management, Six-Sigma, and Benchmarking into organisations.

## 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 organisations are evermore focused on improving supply chain performance. Key to this improvement is quality management. Therefore, quality engineering in product and process design continues to be an evolving, interesting and challenging topic. 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 quality value chain including the entire supply 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 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,
- analysing 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 Quality Engineering. 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 professional and academic background, your experiences are drawn on to illustrate various aspects of cases covered, and this helps to increase motivation and engagement.

A team of around three to four students in UNSW Blackboard will be set and each team will be assigned to a two case assignments. Your Web lecturers have access to your team's discussions will offer guidance when and where necessary. A mixture of activities may include: Case role-plays, individual allocation to particular questions and several other activities to enhance your learning experience.

Lecturers will provide you with feedback and discussion on the assignment, and to understand the concepts and problems in greater depth.

### ***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 three hours per week of face-to-face contact, and it is expected that you will put in, on average, an additional five 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 quality 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 quality issue, especially considering that there may be more than one correct approach.

## **5. ASSESSMENT**

### **General**

You will be assessed by a final examination as well as your continuous participation in completing two major web-based assignments. They may involve calculations, descriptive material and discussions.

Assignments/Case Studies (2x)	50%	(Graduate Attributes: 1, 2, 3, 4, 6, 7, 8, 11 and 15)
Final examination	50%	(Graduate Attributes: 1, 3, 4, and 12)
<b>Overall mark for course</b>	<b>100%</b>	

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 both achieve a composite mark of **at least 50** and a satisfactory level of performance in all assessments.

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

### **Examination**

There will be a two-hour Final at the end of the session. The Final Exam will cover all material covered for the whole session.

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 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 *Administrative Matters*, available from the School website.

### **Assignments**

The assignments will be posted on Blackboard or Moodle and an announcement made about due date for the assignments. Completed assignments will be handed in hard copy by the end of the week the assignment is due. The assignments support 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 quality 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.

### **Submission of Assignments**

Each of you will be assigned to two case studies with set of questions listed and expected to extensively utilise the e-learning system of Moodle. These cases are published by Harvard Business School. The case is copyrighted therefore you need to download it at a reasonable cost (around A\$ 8 dollars) from their website.

Therefore, by the end of Week 3, each team member need to carefully read the “Team Assignment Agreement” which will be posted on Moodle and fill it in and post it again in team’s discussion area. You are expected to discuss these cases and its questions with your team members and **submit a report in Week 13**. Each team’s activities will be closely monitored and marked at both individual and team level accordingly

You need to ensure that you use both appropriate writing style and content of communications and in your report. Conduct which unduly disrupts or interferes with practica activities is not acceptable.

### **Criteria**

The following criteria will be used to grade assignments:

On-line case study discussions:

- Timely Interaction with your team members.
- Quality and appropriateness of on-line communications between you and other team members (note: frequency of communication is relevant but quality of contributions scores much higher).
- Evidence that your contributions help the team focus on the core issues and solutions.
- Identification of key facts and the integration of those facts in a logical development
- Clarity of communication—this includes development of a clear and orderly structure and the highlighting of core arguments

Written reports:

- 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, where appropriate, to support or illustrate the calculations
- Use of tables, where appropriate, to support or shorten the calculations
- Neatness

### 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 is given in Table 1. The suggested answers of these exercises will be released on Moodle immediately after the lectures.

## 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

<b>TOPICS (Chapters from the Textbook)</b>	<b>Week(s)</b>
1. Perspectives of Quality Engineering and Quality Theory <b>(1,2)</b>	1,2
2. Global supply chain quality, Quality standards and Strategic Quality Planning <b>(3,4)</b>	3,4
3. Voice of the Customer and Voice of the Market <b>(5,6)</b>	5
4. Quality in Product and Process Design and Quality Function Deployment <b>(7)</b>	6
5. Managing Supplier Quality in the Supply Chain, Failure Analysis <b>(9)</b>	7
6. The Tools of Quality and Statistical Process Control <b>(10,11)</b>	8,9
7. Statistical Process Control for Attributes <b>(12)</b>	10,11
8. Six-Sigma Management and Tools <b>(13)</b>	11
9. Implementation and Validation <b>(14, 15)</b>	12
10. Course revision and practica	13

<b>Week</b>	<b>Discussion Questions</b>	<b>Problems</b>	<b>Case Studies</b>
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3	Chapter 1, Questions: 6, 11, 16, 17, 18 Chapter 2, Questions: 6, 16, 18 Chapter 3: Questions: 9, 15, 16, 17	-	Case 1.1: FedEx
4	Chapter 4, Questions: 10, 11, 12, 15, 18 Chapter 5, Questions: 2, 13, 15, 18	Chapter 4: Problems 1 to 4	Case 4.1: Ames Rubber Case 5.2: Chaparral Steel
5	Chapter 6, Questions: 3, 5, 7, 10, 11, 19, 21	Chapter 6: Problems 1, 3, 5, 6	
6	Chapter 7, Questions: 6, 9, 11, 16, 17	Chapter 7: Problems 1 to 6	Case 7.1: Ford Taurus
8,9	Chapter 9, Questions: 9, 10, 11, 16, 18, 20	Chapter 9: Problems 1, 3, 5, 7, 9, 14, 16, 20	Case 9.2: Honeywell
9	Chapter 10, Questions: 17, 18, 20	Chapter 10: Problems 13, 14, 17, 18, 20, 22, 23, 26	-
10	Chapter 11, Questions: 4, 9	Chapter 11: Problems 1, 2, 4, 5, 7, 8, 10, 13, 21, 22, 26	-
11	Chapter 12, Questions: 2, 7	Chapter 12: Problems 1, 3, 10, 14, 15, 16, 17, 20, 21, 22, 24, 27, 31	-
12	Chapter 13, Questions: 1, 5, 7, 8, 9, 10	Chapter 13: Problems 1, 5, 6, 9, 10, 12	Case 13.1: The Neiman-Marcus Cookie
13	Chapter 15, Questions: 2, 5, 6	-	

**TABLE 1: PRACTICA EXERCISES**

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

### Prescribed textbook

The prescribed textbook for this course is:

Thomas, Foster, Managing Quality – Integrating the Supply Chain, Prentice Hall, 2007. ISBN: 0132239965.

### Additional materials provided in Moodle

This course uses Moodle which provides a list of assignments, answers to the numerical questions, suggested answers to case studies and assignments and weekly discussion forum.

The discussion forum will be extensively used by Web lecturers of the course throughout the session. Each of you will be assigned to a group by Week 5.

Your Web lecturer has access to your team's discussions and will offer guidance when and where necessary. A mixture of activities may include: Case role plays, individual allocation to particular questions and several other activities to enhance your learning experience.

Log on to UNSW Moodle using the following Web address:

<https://moodle.telt.unsw.edu.au>

## 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.

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.

## 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.

## II. ADMINISTRATIVE MATTERS

You are expected to have read and be familiar with [Administrative Matters](#), 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 2015**