UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Term 1 2020

GSOE9810

PROCESS AND PRODUCT QUALITY IN ENGINEERING

Contents

1. Staff contact details

Contact details and consultation times for course convenor

Name: Dr Erik van Voorthuysen
Office Location: Ainsworth Building (J17), Room 507
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Consultation concerning this course is available immediately after the classes. Face-to-face consultation is preferred.

Contact details and consultation times for additional lecturers/demonstrators/lab staff

Name: Dr Ronald Chan
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Consultation concerning this course is available immediately after the classes. Face-to-face consultation is preferred.

Please see the course Moodle.

2. Important links

- Moodle
- Lab Access
- Health and Safety
- Computing Facilities
- Student Resources
- Course Outlines
- Engineering Student Support Services Centre
- Makerspace
- UNSW Timetable
- UNSW Handbook
- UNSW Mechanical and Manufacturing Engineering

3. Course details

Credit Points

This is a 6 unit-of-credit (UoC) course and involves 4 hours per week (h/w) of face-to-face contact.

The normal workload expectations of a student are approximately 25 hours per term for each UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

You should aim to spend about 12 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.

Contact hours

	Day	**Time**	**Location**
Lecture	Tuesday	18:00 – 21:00	NS Global Theatre

Please refer to your class timetable for the learning activities you are enrolled in and attend only those classes.

Summary and Aims of the course

This course will introduce you to the cornerstones of creating and sustaining an effective organization 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 organizations into the next generation with significantly improved organizational 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.

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.

Demonstration sessions 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 Moodle postings support the lectures and demonstration sessions, 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 demonstration sessions.

Student learning outcomes

This course is designed to address the learning outcomes below 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.	State what an organization needs to do to remain competitive in today's manufacturing environment.	PE2.1, PE2.2, PE2.4, PE3.4
2.	State how an organization can improve its processes and integrate its several functions through the best use of quality engineering.	PE1.3, PE1.5
3.	Be able to determine whether a process is capable of producing a product or service to specifications	PE1.2, PE1.3
4.	Be able to integrate very popular topics like total quality management, Six-Sigma, and Benchmarking into organizations.	PE1.6, PE2.2, PE3.4

4. Teaching strategies

Today's organizations 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 organization'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 demonstration sessions, 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 contents by way of examples drawn from different industries.

Several case discussions will take place in lectures and face-to-face demonstrations as well as through UNSW Moodle page. 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 synthesize 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.

Lectures, demonstration sessions 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 demonstration sessions 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 four to five students in UNSW Moodle will be set and each team will be assigned to two case assignments. Lecturers will provide you with feedback and discussion on the assignment, and to understand the concepts and problems in greater depth.

5. Course schedule

Date	Lecture Content (NS Global Theatre) 18:00-19:30	Suggested Readings	Demonstration (NS Global Theatre) 19:30-21:00
Week 1	Perspectives and scope of Quality Engineering and Issue analysis	Chapter 1 and Lecture notes	Assignment I discussion and Team forming instruction
Week 2	Quality Theory and KFS analysis	Chapter 2 and Lecture notes	Fedex case study
Week 3	Global Supply Chain Quality, Quality Standards	Chapter 3 and 8 and Lecture notes	Aston Martin case study

Date	Lecture Content (NS Global Theatre) 18:00-19:30	Suggested Readings	Demonstration (NS Global Theatre) 19:30-21:00
Week 4	Strategic Quality Planning	Chapter 4 and Lecture notes	Ames Rubber case study
Week 5	Design Theory	Lecture notes only	Axiomatic Design and VDI-2221 case study
Week 6	Voice of the Customer and Voice of the Market	Chapter 5,6, 7 and Lecture notes	Assignment I support
Week 7	Tools of Quality and Acceptance Sampling	Chapter 9,10 Lecture notes and Supplement online material *	Assignment II discussion Questions on Acceptance Sampling, Basic and New 7 tools
Week 8	Statistical Process Control I	Chapter 11 and Lecture notes	Questions on variable control charts
Week 9	Statistical Process Control II	Chapter 12 and Lecture notes	Questions on attribute control charts and capability analysis
Week 10	Six-Sigma Management and Tools, Revision	Chapter 13 and Lecture notes	Assignment II Support

6. Assessment

Assessment overview

Assessment	Group Project?	If Group, # Students per group	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Quiz (online)	No	N/A	10 multiple choice	5%	1	Lecture material from weeks 1-3.	During week 4, demonstration class	N/A	The class after the assessment
Group assignment 1	Yes	4-5	15 pages main body text	20%	1 and 4	Issue Analysis and Strategy	End of Week 6 via Moodle	One week later	Two weeks after submission
Group assignment 2	Yes	4-5	15 pages main body text	25%	1 and 4	Process Performance, Capability and Strategy	End of Week 10 via Moodle	One week later	Upon release of final results
Final exam	No	N/A	2 hours	50%	1, 2 and 3	All course content from weeks 1-10 inclusive.	Exam period, date TBC	N/A	Upon release of final results

Assignments

The assignments will be posted on Moodle or handed out in class, and a reminder announcement will be made about the due date for the assignments. 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 teamwork and integration of different ideas and components into an overall coherent quality management strategy.

Assignment 1 focuses on a quality management case study that forms the basis for identifying and understanding engineering quality issues and problems. Students are to critically analyse these issues against various drivers (customer requirements, competitors, regulations, organisational skills and capabilities etc) and generate appropriate and innovative solutions (hypotheses) to these issues.

For Assignment 2, students are required to analyse a large dataset containing process performance and quality data and to apply appropriate statistical methods to identify the nature and extent of the problems and to use this analysis to suggest improvements to the process.

The following criteria will be used to grade assignments:

Written reports

- Analysis and Evaluation of assignments by integrating knowledge gathered in lectures, demonstration sessions 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

Presentation

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Submission

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 per cent (20%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

a. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
b. Online quizzes where answers are released to students on completion, or
c. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
d. Pass/Fail assessment tasks.

Marking

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Other assessments

Additional assessments may be given in class to reinforce topics and provide early feedback. These assessments will not contribute to the final mark.

Examinations

There will be a two (2) hour final examination scheduled at the end of session, covering all material and all chapters in the prescribed textbook.

You must be available for all tests and examinations. Final examinations for each course are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates.

For further information on exams, please see the Exams webpage.

Online Quiz

The quiz will be conducted online via Moodle. The format of the quiz is like those that are done on paper, which consists of multiple-choice questions, calculations and short answer questions. The link to the quiz will be available on Tuesday evening of the quiz week, during the last hour of the allocated lecture time. Each student gets ONE attempt to complete the

quiz within the set time limit. The quiz will automatically shut down at 9pm precisely, regardless of the time the quiz was started. The feedback of the quiz will be provided after the quiz is closed. Note that the quiz questions are randomly drawn from a question bank with similar theme and difficulty, numerical questions may appear with random input numbers, so students will not expect to get the exact same question. Students are expected to complete the quiz individually.

You must be available for all tests and examinations.

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 available 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 Engineering Student Support Services Centre prior to the examination. Calculators not bearing an "Approved" sticker will not be allowed into the examination room.

Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

Please note that UNSW now has a Fit to Sit / Submit rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

7. Expected resources for students

Lecture notes for all topics will be posted on Moodle. For all e-Books and reference books please visit the UNSW Library website: https://www.library.unsw.edu.au/

Textbooks

The prescribed textbook for this course is:

S. Thomas, Foster, Managing Quality: Integrating the Supply Chain: International Edition (5e), Pearson Higher Ed, 2012. ISBN: 9780273768258.

You can purchase the eBook version directly from the publisher at:

http://www.pearson.com.au/products/D-G-Foster/Managing-Quality-Integrating-the-Supply-Chain-International-Edition/9780273768258?R=9780273768258

UNSW Library website: https://www.library.unsw.edu.au/
Moodle: https://moodle.telt.unsw.edu.au/login/index.php

8. Course evaluation and development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience 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.

9. 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, visit: 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

10. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

Dr Erik van Voorthuysen and Dr Ron Chan
January, 2020

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	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