

GSOE9810

Process and Product Quality in Engineering

Term 1, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Dr Erik van Voorthuysen	erikv@unsw.edu.au	During and immediately after tutorials, on Moodle, Teams and by appointment	ME507	9385 4147

Lecturers

Name	Email	Availability	Location	Phone
Dr Ron Chan	r.chan@unsw.edu.au	During and immediately after tutorials, on Moodle, Teams and by appointment	ME507	9385 1535
Dr Jin Zhang	jin.zhang6@unsw.edu.au	During and immediately after tutorials, on Moodle, Teams and by appointment	ME331	9385 4090

School Contact Information

Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

Hours

9:00–5:00pm, Monday–Friday*

*Closed on public holidays, School scheduled events and University Shutdown

Web

[School of Mechanical and Manufacturing Engineering](#)

[Engineering Student Support Services](#)

[Engineering Industrial Training](#)

[UNSW Study Abroad and Exchange](#) (for inbound students)

[UNSW Future Students](#)

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office**

**Please note that the School Office will not know when/if your course convenor is on campus or available

Email

[Engineering Student Support Services](#) – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

[School Office](#) – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries. The School will only be able to refer students on to the relevant team if contacted

Important Links

- [Student Wellbeing](#)
- [Urgent Mental Health & Support](#)
- [Equitable Learning Services](#)
- [Faculty Transitional Arrangements for COVID-19](#)

- [Moodle](#)
- [Lab Access](#)
- [Computing Facilities](#)
- [Student Resources](#)
- [Course Outlines](#)
- [Makerspace](#)
- [UNSW Timetable](#)
- [UNSW Handbook](#)

Course Details

Units of Credit 6

Summary 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.

Course Aims

This course is designed to cover the core concepts and dynamic approaches in quality engineering. 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. 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.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. State what an organisation needs to do to remain competitive in today's manufacturing environment	PE2.1, PE2.2, PE2.4, PE3.4
2. State how an organisation 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 organisations	PE1.6, PE2.2, PE3.4

Teaching Strategies

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 or web-based contents by way of examples drawn from different industries. Several case discussions will take place in lectures and 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.

Additional Course Information

All lectures and tutorials will be held online in T1, 2022. Most lectures will be synchronous and recordings will be placed on Moodle for you to watch or revise them in your own time. Tutorials will be held synchronously (in real time) and you are encouraged to attend these.

Assessment

In addition to a short quiz in Week 4, the main assessments consist of two written assignments and a final exam. 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. The first assignment also contains an individually marked component. 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 assignments will be posted on Moodle 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 team work and integration of different ideas and components into an overall coherent quality management strategy.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online Quiz	5%	Week 4 finishing at 6:00pm	1, 2, 3, 4
2. Quality Strategy Assignment	20%	Friday Week 7 at 09:00 PM	1, 2, 3, 4
3. Statistical Process Control Assignment	25%	Friday Week 10 at 9:00pm	1, 2, 3, 4
4. Final Exam	50%	Not Applicable	1, 2, 3, 4

Assessment 1: Online Quiz

Start date: Week 4 commencing at 5:00 PM

Assessment length: 1 hour

Due date: Week 4 finishing at 6:00pm

The online quiz covers critical material from week 1-3 early in the course and will focus on the key definitions, theory and concepts of Quality Management. You must make yourself available during the set time for this quiz.

Assessment criteria

The quiz will be conducted online via Moodle. The format of the quiz consists of multiple choice, calculations and short answer questions. The link to the quiz will be available on Thursday afternoon at

5pm 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 6pm 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.

Additional details

Details will be posted on Moodle

Assessment 2: Quality Strategy Assignment

Assessment length: 4 pages of typewritten text maximum

Submission notes: A link will be provided on Moodle for submission

Due date: Friday Week 7 at 09:00 PM

A quality management case study forms the basis for identifying and understanding engineering quality issues and problems and students are to critically analyse these issues against various drivers (customer requirements, competitors, regulations, organisational skills and capabilities etc) and to generate appropriate and innovative solutions (hypotheses) to these issues. The purpose of this assignment is to develop critical thinking skills and a systematic way of solving complex problems. This is a key skill required in industry.

Assessment criteria

An Issue Analysis consists of five (5) key elements and each of these elements needs to be carefully thought through and documented. They are:

1. Identification of Issues. Some issues will be obvious and even explicit. Many important issues and sub-issues may not be obvious up front.
2. Development of Hypotheses. This element asks for creativity, innovation and insight in terms of what degrees of freedom you can identify and what may solve the issues identified in Part 1.
3. What information, knowledge and understanding do you need to have in order to prove or disprove your Hypotheses? This is the start of the analysis phase. This can be considered a critical part of deductive reasoning.
4. Analysis. How will you get this information. You do not have to actually perform the analysis but you do have to identify what analysis you will perform, based on what you have learned in the course so far.
5. Data. What data will be analysed and where will this data come from?

And in addition to these 5 elements:

6. Each student will also submit an individual section, of no more than one (1) page in length, describing how the team resolved the issue analysis and what they thought worked well and what could be improved. This is strictly an individual reflection on the actual issue analysis process.

Criteria for success and full marks: An analysis that follows the key steps of Issue Analysis (weeks 1 and 2) and that is comprehensive in each of points 1-5 described above and an individual section that reflects a good understanding of the method itself, the outcomes of working through this method and how the team and the individual achieved this outcome and a critical analysis of what worked well and what could be improved.

Additional details

Details of the assignment will be posted on Moodle. The group report will be submitted via Moodle and the individual section of this report will also be submitted via Moodle.

Assessment 3: Statistical Process Control Assignment

Submission notes: A link will be provided on Moodle for you to submit the assignment

Due date: Friday Week 10 at 9:00pm

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.

Assessment criteria

The marks will be allocated as follows (in equal weights):

1. The Issue Analysis based on the information provided in the case study
2. Data visualisation of the data provided in the case study.
3. Statistical Process Control - analysis and results.
4. Analysis of Process Capability
5. Completion of the Issue Analysis and development of a contingent and coherent quality strategy for the business

Additional details

Assignment details will be posted on Moodle

Assessment 4: Final Exam

The final exam covers all material taught in the course. The exam will be held online on the Inpera platform during the formal exam period.

Assessment criteria

The exam will consist of multiple choice questions as well as questions requiring you to enter numerical results. In each case, there will be only one correct answer.

Additional details

The Final Exam will be held during the exam period set by UNSW.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 14 February - 18 February	Lecture	Perspectives and scope of Quality Engineering and Issue analysis. Chapter 1 and Lecture notes.
	Tutorial	Assignment 1 discussion and Team forming instruction
Week 2: 21 February - 25 February	Lecture	Quality Theory and KFS analysis. Chapter 2 and Lecture notes.
	Tutorial	Discussion of the FEDEX case study. General discussion of topics in Weeks 1 and 2.
Week 3: 28 February - 4 March	Lecture	Global Supply Chain Quality, Quality Standards. Chapter 3 and 8 and Lecture notes.
	Tutorial	Case Study discussion. Details will be posted on Moodle.
Week 4: 7 March - 11 March	Lecture	Strategic Quality Planning. Chapter 4 and Lecture notes.
	Assessment	Online quiz worth 5% of the total course mark will be held this week.
Week 5: 14 March - 18 March	Lecture	Design Theory.
	Tutorial	Axiomatic Design and VDI-2221 case study.
Week 6: 21 March - 25 March	Lecture	Voice of the Customer and Voice of the Market
	Tutorial	Assignment 1 Support
Week 7: 28 March - 1 April	Lecture	Acceptance Sampling Theory and the Operating Characteristic Curve. Chapter 5,6, 7 and Lecture notes. The Tools of Quality. Chapter 9,10 Lecture notes and Supplement online material .
	Tutorial	Assignment 1 support prior to submission.
Week 8: 4 April - 8 April	Lecture	Statistical Process Control I. Chapter 11 and

		Lecture notes.
	Tutorial	Questions on variable control charts Assignment II discussion Questions on Acceptance Sampling, Basic and New 7 tools
Week 9: 11 April - 15 April	Lecture	Statistical Process Control II. Chapter 12 and Lecture notes.
	Tutorial	Questions on attribute control charts and capability analysis.
Week 10: 18 April - 22 April	Lecture	Six-Sigma Management and Tools, Revision. Chapter 13 and Lecture notes.
	Tutorial	Assignment II Support prior to submission.

Resources

Prescribed Resources

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 (6e), Pearson Higher Ed, 2012. ISBN: 9780273768258.

You can purchase the eBook version directly from the publisher at: <https://www.pearson.com.au>

The print version is available from the UNSW bookstore: <https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9781292154213>

UNSW Library website: <https://www.library.unsw.edu.au/>

Moodle: <https://moodle.telt.unsw.edu.au/login/index.php>

Recommended Resources

Not available

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.

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

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.

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.

Late policy

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

The late penalty is applied per calendar day (or part thereof), including weekends and public holidays, that the assessment is overdue.

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

- Your course has an assessment task worth a total of **30 marks (Max Possible Mark)**
- You submit the assessment **2 days after the due date**
- The assessment is marked as usual and achieves a score of **20 marks (Awarded Mark)**
- The late policy is applied using **Late Mark = Awarded Mark - (Days*Penalty per Day)*Max Possible Mark**. Your adjusted final score is **8 marks** ($20 - ((2*0.2)*30)$).

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:

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

Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations, these 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.

Special Consideration

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.

UNSW now has a [Fit to Sit / Submit rule](#), which means that if you attempt 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](#).

Please note that students will **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID-19 illness or isolation** will be required.

Special Consideration Outcomes

Assessments have default Special Consideration outcomes. The default outcome for the assessment will be advised when you apply for Special Consideration. Below is the list of possible outcomes:

Outcome	Explanation	Example
Time extension	Student provided more time to submit the assessment	e.g. 1 more week of time granted to submit a report
Supplementary assessment	Student provided an alternate assessment at a later date/time	e.g. a supplementary exam is scheduled during the supplementary exam period of the term
Substitute item	The mark for the missed assessment is substituted with the mark of another assessment	e.g. mark for Quiz 1 applied also applied as mark for Quiz 2, meaning if a student achieved a mark of 20/30 for Quiz 1 and was granted Special Consideration for Quiz 2, a mark of 20/30 would be applied for Quiz 2, etc
Exemption	All course marks are recalculated excluding this assessment and its weighting	e.g. The course has an assessment structure of: <ul style="list-style-type: none"> - Assignments 30%, - Lab report 30%, - Final Exam 40%. If the Lab report is missed and student is granted Special Consideration, then the assessment structure may be reweighted as follows: <ul style="list-style-type: none"> - Assignments 50% - Final Exam 50% as though the Lab report did not exist
Non-standard	Course Coordinator is contacted for the outcome when special consideration is granted as the outcome differs on a case-by-case basis	e.g. typical for group assessments where time extension supplementary assessment could be granted to the group member, time extension could be granted to the whole group, etc. Clarify with your Course Convenor for

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

Academic Information

Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

On-campus class attendance

****T1-2022 UPDATE****

Public distancing conditions must be followed for all face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. No over-enrolment is allowed in face-to-face classes. Students enrolled in online classes can swap their enrolment from online to on-campus classes by Sunday, Week 1. Please refer to your course's Microsoft Teams and Moodle sites for more information about class attendance for in-person and online class sections/activities.

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by [NSW health](#) or government authorities. Current alerts and a list of hotspots can be found [here](#). **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed. Further information is available on any course Moodle or Teams site.

In certain classroom and laboratory situations where physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to the FAQs: <https://www.covid-19.unsw.edu.au/safe-return-campus-faqs>

Guidelines

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

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)

- [Academic Honesty and Plagiarism](#)

Image Credit

Photo by Stephen Blake March 2017, Willis Annexe (J18) Thermofluids lab

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering 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	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in 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	