



UNSW Course Outline

GSOE9712 Engineering Statistics and Experiment Design - 2024

Published on the 01 Feb 2024

General Course Information

Course Code : GSOE9712

Year : 2024

Term : Term 1

Teaching Period : T1

Is a multi-term course? : No

Faculty : Faculty of Engineering

Academic Unit : School of Mechanical and Manufacturing Engineering

Delivery Mode : Multimodal

Delivery Format : Standard

Delivery Location : Kensington

Campus : Sydney

Study Level : Undergraduate, Postgraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

This course covers fundamental statistics, design of experiment (DOE), and development of process improvement strategy. Teaching will focus on using engineering industry-based problems, supplemented with the use statistics software package - Minitab. Students will also

learn how to compile report to effectively present information from a managerial perspective.

Course Aims

The course will introduce statistics, mathematics and associated techniques for analysing complex engineering processes for the purpose of improvement. Major disciplines covered include issue analysis, data collection, statistical data analysis, process modelling, decision-making and implementation. The course focuses on developing experimental techniques using statistical methods to test the performance of the processes in an engineering industry.

Course Learning Outcomes

Course Learning Outcomes
CL01 : Demonstrate critical thinking and derive improvement strategies from a managerial perspective
CL02 : Perform both parametric and non-parametric hypothesis tests for a range of engineering research problems
CL03 : Design and plan experiments to collect data to uncover critical information and knowledge in industry-based problems
CL04 : Demonstrate effective written communication skills for management

Course Learning Outcomes	Assessment Item
CL01 : Demonstrate critical thinking and derive improvement strategies from a managerial perspective	<ul style="list-style-type: none">• Online Quiz• Data Mining Assignment• Design of Experiment and Process Improvement Assignment• Final Exam
CL02 : Perform both parametric and non-parametric hypothesis tests for a range of engineering research problems	<ul style="list-style-type: none">• Online Quiz• Data Mining Assignment• Design of Experiment and Process Improvement Assignment• Final Exam
CL03 : Design and plan experiments to collect data to uncover critical information and knowledge in industry-based problems	<ul style="list-style-type: none">• Online Quiz• Design of Experiment and Process Improvement Assignment• Final Exam
CL04 : Demonstrate effective written communication skills for management	<ul style="list-style-type: none">• Design of Experiment and Process Improvement Assignment

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Online Quiz Assessment Format: Individual	15%	Start Date: Week 3, 7 and 9 Exam Date and Time Due Date: Week 3, 7 and 9 Exam Date and Time
Data Mining Assignment Assessment Format: Individual	25%	Start Date: Week 4 Due Date: Week 7
Design of Experiment and Process Improvement Assignment Assessment Format: Individual	25%	Start Date: Week 7 Due Date: Week 10
Final Exam Assessment Format: Individual	35%	Start Date: Exam period Due Date: Exam period

Assessment Details

Online Quiz

Assessment Overview

Assessment length: 75 minutes

Students have to conduct 3 online quizzes during demonstration session in the computer lab. Each quiz will worth 5% of their final assessment mark.

The format of the quiz will contain both multiple choices and 'filling values into a box' questions.

Assessment criteria

Multiple choice questions - student must select the 'most correct' answer from a list of choices. All questions have equal weight. No partial mark will be given.

Filling-value into a box questions - student must provide the correct value for each question. All questions have equal weight. No partial mark will be given.

Students are expected to submit their working out at the end each quiz. The working out can be in the form of handwritten notes, Excel files, Minitab files or equivalent that demonstrate the student's own work.

Student can review their quiz online 1 week after the assessment and when all supplementary quizzes are completed.

Course Learning Outcomes

- CL01 : Demonstrate critical thinking and derive improvement strategies from a managerial perspective
- CL02 : Perform both parametric and non-parametric hypothesis tests for a range of engineering research problems
- CL03 : Design and plan experiments to collect data to uncover critical information and knowledge in industry-based problems

Detailed Assessment Description

See above

Assessment Length

75 minutes

Assignment submission Turnitin type

Not Applicable

Data Mining Assignment

Assessment Overview

Submission notes: This assessment will be conducted via VIVA format

Marks returned: On the spot feedback will be provided. Mark will be returned after all VIVA assessments are completed.

- Your team need to present your work in two ways:
 1. Submit an executive summary in a .pdf document
 2. Book a time for a 20-minute face-to-face VIVA assessment
- In the VIVA assessment, you may get asked to answer questions that do not directly appear in the case study.
- In the VIVA assessment, you may want to show your assessors supplement materials such as graphs and diagrams to support your answers.
- In the VIVA assessment, please ensure that every member has identical supporting documents. When a team member gets asked a question, other team members can help them to locate the supplementary material. Remember, this is a team effort, you are NOT competing with your team members.
- Each team member should work on the assignment by themselves first before calibrating with their team members.

- As this is a high-weighting summative assessment, early-feedback will not be provided. i.e. you cannot show your solution to your lecturer before the due date of the assessment and ask for informal feedback. You may, of course, consult your lecturer to clarify any terms or sentences in the scenario that may not be clear to your team.
- You may need to make reasonable assumptions to complete your assignment.
- Students must only work with other students in their group. Evidence of collusion between groups, as indicated by similar assignments, will result in zero marks.

Assessment criteria

- Executive Summary – is the executive summary presented with high quality and accurate information with recommendation in plain English? (/5)
- Organisation – are the information presented in an organised manner and well the team organize themselves? (/10)
- Accuracy – are the questions answered accurately during the VIVA assessment? (/10)

Additional details

Assignment 1 Executive Summary Submission

- Each team is to produce an Executive Summary with supporting documents to address the assignment task.
- Only 1 submission is required per team.
- Please nominate only 1 team member to make the final submission, further submission will automatically overwrite the previous submission.

Assignment 1 Viva Assessment

- Evaluation duration: Maximum 20 minutes

Course Learning Outcomes

- CL01 : Demonstrate critical thinking and derive improvement strategies from a managerial perspective
- CL02 : Perform both parametric and non-parametric hypothesis tests for a range of engineering research problems

Detailed Assessment Description

See above

Submission notes

This assessment will be conducted via VIVA format

Assessment information

Assignment 1 Executive Summary Submission

- Each team is to produce an Executive Summary with supporting documents to address the assignment task.
- The submission needs to be uploaded to Moodle by Week 7, Monday, 9am (Sydney Time).
- Only 1 submission is required per team.
- Please nominate only 1 team member to make the final submission, further submission will automatically overwrite the previous submission.

Assignment 1 Viva Assessment

- Evaluation period: Monday to Friday, Week 7
- Possible time slot period: See Booking Page on Moodle
- Evaluation duration: Maximum 20 minutes
- Regardless of your evaluation time, your team is required to submit your Written Part on Moodle by Week 7, Monday, 9am (Sydney Time)

Assignment submission Turnitin type

Not Applicable

Design of Experiment and Process Improvement Assignment

Assessment Overview

Students will work in a team (min. 2, max. 3 members per team) to analyse an industry-based case study. Students have to identify issues, plan experiments to collect data, analyse simulated data, uncover trends and derive improvement strategies for management of the business.

Indicative Effort

An assignment template will be provided to outline the requirement of this assessment - word counts guideline will be provided in the template.

Executive Summary (/5)

- Concise summary provided in plain English
- Problem, methodology and results are clearly presented

Quality of the key finding (/45)

- Provided a quality summary
- Provided relevant and high quality graphical evidence
- Provided correct hypothesis test
- Provided concise and relevant recommendation

Assignment 2 Submission

- Each team will be provided with a template to complete and report their findings
- Only 1 submission is required per team.
- Please nominate only 1 team member to make the final submission, further submission will automatically overwrite the previous submission.

Marks returned:

- Grade will be provided upon the release of the final course result

Course Learning Outcomes

- CL01 : Demonstrate critical thinking and derive improvement strategies from a managerial perspective
- CL02 : Perform both parametric and non-parametric hypothesis tests for a range of engineering research problems
- CL03 : Design and plan experiments to collect data to uncover critical information and knowledge in industry-based problems
- CL04 : Demonstrate effective written communication skills for management

Detailed Assessment Description

See above

Submission notes

The report will be submitted via Moodle

Assignment submission Turnitin type

Not Applicable

Final Exam

Assessment Overview

The final exam will be centrally managed and will cover all contents in the course.

Indicative Effort

The final exam must be completed within 120 minutes during a designated time in the exam period.

Course Learning Outcomes

- CL01 : Demonstrate critical thinking and derive improvement strategies from a managerial perspective
- CL02 : Perform both parametric and non-parametric hypothesis tests for a range of engineering research problems
- CL03 : Design and plan experiments to collect data to uncover critical information and knowledge in industry-based problems

Detailed Assessment Description

See above

Submission notes

Moodle Exam

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	<ul style="list-style-type: none"> • Strategy of Experimentation • Basic Principle of Experimental Design • Data Visualisation Tools • Revision of Basic Probability Distribution
Week 2 : 19 February - 25 February	Lecture	<ul style="list-style-type: none"> • Hypothesis Test Revision • Confidence Intervals • Student's t-test vs Z-test
Week 3 : 26 February - 3 March	Lecture	<ul style="list-style-type: none"> • Student's t-test vs Z-test • Paired t-test • Comparison of sample variances
	Assessment	Quiz 1 <ul style="list-style-type: none"> • Content covered - Week 1 and 2 content • You MUST complete your quiz within the strict time window per stated in the UNSW exam timetable • You get 1 attempt to this quiz with 75 minutes time limit
Week 4 : 4 March - 10 March	Lecture	<ul style="list-style-type: none"> • Introduction to ANOVA (one-way and two-way) • Fixed Effect Model • ANOVA Model Adequacy Checks • Tukey's Comparison Test
Week 5 : 11 March - 17 March	Lecture	<ul style="list-style-type: none"> • Statistical Analysis of RCBD • Latin Square Design
Week 6 : 18 March - 24 March	Lecture	<ul style="list-style-type: none"> • Graeco-Latin Square Design • Balanced Incomplete Block Designs
Week 7 : 25 March - 31 March	Lecture	<ul style="list-style-type: none"> • The Advantage of Factorial Design • Two-Factor Factorial Design • General Factorial Design • Blocking in Factorial Design
	Assessment	Quiz 2 <ul style="list-style-type: none"> • Content covered - Week 1 to 6 content • You MUST complete your quiz within the strict time window per stated in the UNSW exam timetable • You get 1 attempt to this quiz with 75 minutes time limit
	Assessment	Assignment 1 due Assignment 1 Executive Summary Submission Assignment 1 Viva Assessment
Week 8 : 1 April - 7 April	Lecture	<ul style="list-style-type: none"> • The 22 Design • The 23 Design • The 2k Design • Single Replicate in 2k Design
Week 9 : 8 April - 14 April	Lecture	<ul style="list-style-type: none"> • Blocking a Replicated 2k Factorial Design • Confounding in a 2k Factorial Design • Confounding in a 2k Factorial Design in Two Blocks • Partial Confounding
	Assessment	Quiz 3 <ul style="list-style-type: none"> • Content covered - Week 1 to 8 content • You MUST complete your quiz within the strict time window per stated in the UNSW exam timetable • You get 1 attempt to this quiz with 75 minutes time limit
Week 10 : 15 April - 21 April	Lecture	• Course Revision for the Final Exam
	Assessment	Assignment 2 due Assignment 2 Report Submission

Attendance Requirements

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

Course Resources

Prescribed Resources

Douglas C. Montgomery, Design and analysis of experiments, 8th ed, Hoboken, N.J.: John Wiley & Sons, Inc., 1118146921

You can find a free e-copy of the textbook from the UNSW library.

Course Evaluation and Development

In this course, recent improvements resulting from student feedback include the continuous use of VIVA assessment as it received positive feedback.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Ron Chan		Room ME507, Ainsworth Building	9385 1535	Send Ron a text using Microsoft Team to book a private consultation session outside class time	No	Yes

Other Useful Information

Academic Information

I. 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, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, 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](#).

II. Administrative matters and links

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](#)
- [Equitable Learning Services](#)

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: <https://www.unsw.edu.au/engineering/student-life/student-resources/program-design>.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

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.

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 or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) 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. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be 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 will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;

- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, 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

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)

School-specific Information

Short Extensions

Short extensions are not currently applicable to Mechanical and Manufacturing Engineering Courses.

Review of Results

The purpose of a review of results is if there was a marking error. Review of results is for when you have cause to believe that there is a marking error. Review of Results cannot be used to get feedback. If you would like feedback for assessments prior to the final exam, you are welcome to contact the course convenor directly. No feedback will be provided on final exams.

Use of AI

The use of AI is prohibited unless explicitly permitted by the course convenor. Please respect this and be aware that penalties will apply when unauthorised use is detected, such as through Turnitin. If the use of generative AI, such as ChatGPT, is allowed in a specific assessment, they must be properly credited, and your submissions must be substantially your own work.

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](#)