

ENG403 Engineering Research Methodology

School: School of Science, Technology and Engineering

2024 Semester 2

UniSC Sunshine Coast

**BLENDED
LEARNING**

Most of your course is on campus but you may be able to do some components of this course online.

Please go to usc.edu.au for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1. Description

Problem solving skills are essential requirements for engineers. When complex theoretical and technical problems are solved, new knowledge is created. In this course you learn how to apply the engineering research process and methods of inquiry to solve these problems. This involves critiquing current research in your discipline and developing competence in using instruments and software to collect data. You analyse and evaluate the results and judge their quality and limitations. You also learn how to communicate findings in specific engineering formats to specialist audiences.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Lecture	2hrs	Not applicable	13 times
Tutorial/Workshop 1	2hrs	Not applicable	12 times

1.3. Course Topics

Literature search,

review and citation practices

Problem identification, formulating research questions

Quantitative and qualitative methods – strengths and weaknesses

Instrumentation and data logging

Data sampling, collection, testing

Data analysis, interpretation and limitations

Validity, reliability, sources of error

Data management and presentation

2. What level is this course?

400 Level (Graduate)

Demonstrating coherence and breadth or depth of knowledge and skills. Independent application of knowledge and skills in unfamiliar contexts. Meeting professional requirements and AQF descriptors for the degree. May require pre-requisites where discipline specific introductory or developing knowledge or skills is necessary. Normally undertaken in the third or fourth full-time study year of an undergraduate program.

3. What is the unit value of this course?

12 units

4. How does this course contribute to my learning?

COURSE LEARNING OUTCOMES	GRADUATE QUALITIES MAPPING	PROFESSIONAL STANDARD MAPPING *
On successful completion of this course, you should be able to...	Completing these tasks successfully will contribute to you becoming...	Engineers Australia Stage 1 Professional Engineer Competency Standards
1 Apply current knowledge of quantitative and qualitative methods used in engineering research.	Empowered	1.4
2 Analyse, interpret and evaluate data that relate to complex theoretical and technical engineering problems.	Creative and critical thinker	2.1, 2.2
3 Communicate complex research results to specialist audiences.	Engaged	3.3, 3.4
4 Act professionally, autonomously and in teams to produce a professional product.	Ethical	3.4, 3.5, 3.6

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1.4	Knowledge and Skill Base: Discernment of knowledge development and research directions within the engineering discipline.
2.1	Engineering Application Ability: Application of established engineering methods to complex engineering problem solving.
2.2	Engineering Application Ability: Fluent application of engineering techniques, tools and resources.
3.3	Professional and Personal Attributes: Creative, innovative and pro-active demeanour.
3.4	Professional and Personal Attributes: Professional use and management of information.
3.5	Professional and Personal Attributes: Orderly management of self, and professional conduct.
3.6	Professional and Personal Attributes: Effective team membership and team leadership.

5. Am I eligible to enrol in this course?

Refer to the [UniSC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1. Pre-requisites

192 units and enrolled in Program SC410, SC411, SC425

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

- 5.4. Specific assumed prior knowledge and skills (where applicable)
 Statistics, computer programming (e.g. MATLAB and EXCEL scripting) to analyse data

6. How am I going to be assessed?

6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

6.2. Details of early feedback on progress

Online quizzes from week 2 will provide both the student and the lecturer/tutors with a mechanism for tracking the student's progress.

6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Artefact - Technical and Scientific, and Written Piece	Group	40%	Pitch video + 1500 word technical report	Week 7	Online Assignment Submission with plagiarism check
All	2	Literature Review (or component)	Individual	30%	1500 words	Week 12	Online Assignment Submission with plagiarism check
All	3	Quiz/zes	Individual	30%	Online quizzes related to the material presented each week	Throughout teaching period (refer to Format)	Online Submission

All - Assessment Task 1: Data Analyses of an Engineering-based Problem

GOAL:	This is an authentic assessment item that immerses you in the complexity you can expect as a practicing engineer applying your knowledge of the engineering research process and methods. You will demonstrate skill in data techniques to determine the limitations inherent in measurement and analyses.																		
PRODUCT:	Artefact - Technical and Scientific, and Written Piece																		
FORMAT:	<p>You will be participating in the GovHack Queensland weekend event and provided with real data that is in the public domain. You will work collaboratively to create a video pitch of idea/concept and solution and write a technical report on analyses conducted.</p> <p>You will be awarded an individual grade according to an algorithm that uses the grade assigned by the lecturer/tutor for the whole task plus a rating of your contribution by the other students in the group (a peer assessment)-. Peer ratings are submitted when you submit the report. Marks will be recorded and made available to students through Gradebook.</p>																		
CRITERIA:	<table border="1"> <thead> <tr> <th>No.</th> <th>Learning Outcome assessed</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Oral presentation: Pitch Video</td> <td>3</td> </tr> <tr> <td>2</td> <td>Identification of the problem to be solved</td> <td>2</td> </tr> <tr> <td>3</td> <td>Analysis and evaluation of data</td> <td>2</td> </tr> <tr> <td>4</td> <td>Technical report</td> <td>3</td> </tr> <tr> <td>5</td> <td>Demonstration of a professional attitude and collaboration in a team environment (peer review)</td> <td>4</td> </tr> </tbody> </table>	No.	Learning Outcome assessed	1	Oral presentation: Pitch Video	3	2	Identification of the problem to be solved	2	3	Analysis and evaluation of data	2	4	Technical report	3	5	Demonstration of a professional attitude and collaboration in a team environment (peer review)	4	
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3	Analysis and evaluation of data	2																	
4	Technical report	3																	
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GENERIC SKILLS:	Communication, Collaboration, Information literacy																		

All - Assessment Task 2: Literature review and identifying a research question

GOAL:	You will take the role of a researcher and write an individual 1500 word literature review and critically analyse a publication in a relevant Civil or Mechanical Engineering field.	
PRODUCT:	Literature Review (or component)	
FORMAT:	1500 words Harvard referencing More information in your Blackboard assignment folder.	
CRITERIA:	No.	Learning Outcome assessed
	1	Evaluation of quantitative and qualitative methods – lit review 1
	2	Critical analysis and evaluation – lit review 3
	3	Synthesis – review of a single publication within the field 3
	4	Quality of submission 4
GENERIC SKILLS:	Communication, Information literacy	

All - Assessment Task 3: Three Quizzes

GOAL:	To demonstrate and apply knowledge, analyse relationships, and solve problems in Engineering research methods.	
PRODUCT:	Quiz/zes	
FORMAT:	Weeks 4, 8 and 12 You will be asked to solve Engineering problems in an online quiz for three weeks of the semester on Blackboard based on material covered in the lectures and tutorials.	
CRITERIA:	No.	Learning Outcome assessed
	1	Interpretation and evaluation of quantitative methods 1
GENERIC SKILLS:		

7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Student workload is calculated at 12.5 learning hours per one unit.

8. What resources do I need to undertake this course?

Please note: Course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Canvas site– Please log in as soon as possible.

8.1. Prescribed text(s) or course reader

Please note that you need to have regular access to the resource(s) listed below. Resources may be required or recommended.

REQUIRED?	AUTHOR	YEAR	TITLE	EDITION	PUBLISHER
Required	Thiel, D. V.	2014	Research Methods for Engineering (ebook available through the library)	n/a	Cambridge University Press, UK

8.2. Specific requirements

Safety glasses and closed in footwear

9. How are risks managed in this course?

Risk assessments have been performed for all laboratory classes and a moderate level of health and safety risk exists. Moderate risks are those associated with laboratory work such as working with chemicals and hazardous substances. You will be required to undertake laboratory induction training and it is also your responsibility to review course material, search online, discuss with lecturers and peers and understand the health and safety risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the [online induction training for students](#), and following the instructions of the University staff

10. What administrative information is relevant to this course?

10.1. Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

10.2. Assessment: Additional Requirements

Eligibility for Supplementary Assessment

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

The final mark is in the percentage range 47% to 49.4%

The course is graded using the Standard Grading scale

You have not failed an assessment task in the course due to academic misconduct

10.3. Assessment: Submission penalties

Late submission of assessment tasks may be penalised at the following maximum rate:

- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.

- 10% (of the assessment task's identified value) for the third day - 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.

- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task. Weekdays and weekends are included in the calculation of days late. To request an extension you must contact your course coordinator to negotiate an outcome.

10.4. SafeUniSC

UniSC is committed to a culture of respect and providing a safe and supportive environment for all members of our community. For immediate assistance on campus contact SafeUniSC by phone: [07 5430 1168](tel:0754301168) or using the [SafeZone](#) app. For general enquires contact the SafeUniSC team by phone [07 5456 3864](tel:0754563864) or email safe@usc.edu.au.

The SafeUniSC Specialist Service is a Student Wellbeing service that provides free and confidential support to students who may have experienced or observed behaviour that could cause fear, offence or trauma. To contact the service call [07 5430 1226](tel:0754301226) or email studentwellbeing@usc.edu.au.

10.5. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the [Learning Advisers](#) web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au.

10.6. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to [Student Hub](#), email studentwellbeing@usc.edu.au or call 07 5430 1226.

10.7. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, [AccessAbility Services](#) can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to [Student Hub](#), email AccessAbility@usc.edu.au or call 07 5430 2890.

10.8. Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit <https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

10.9. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The [Student Charter](#) sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.

10.10. General Enquiries

In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au