COURSE OUTLINE

MCH303 Engineering Computer Applications and Interactive Modelling

School: School of Science, Technology and Engineering

2026 | Trimester 1

UniSC Moreton Bay

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 unisc.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

In this course you will develop advanced level programming techniques, computer applications and interactive modelling in mechatronic systems engineering. Rigorous development of computer applications and interactive modelling techniques have helped enormously in improving the performance and efficiency of a mechatronic system and enhanced its reliability. You will get the opportunity to use programming languages; C/C++, and software tools; MATLAB/SimuLink and LabVIEW, to perform programming, interactive modelling and simulation to analyse and solve physical engineering problems.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – Asynchronous weekly learning material	1hr	Week 1	12 times
Seminar – On campus	1hr	Week 1	3 times
Tutorial/Workshop 1 – On campus	2hrs	Week 1	10 times
Laboratory 1 – On campus	2hrs	Week 2	5 times

1.3. Course Topics

Topics may include:

- Advanced computer programming and modelling methodologies in engineering.
- Introduction to software tools such as C/C++, MATLAB / SimuLink, LabView.
- Modelling and interpreting physical engineering concepts into computational problems.
- Analysing and solving physical engineering problems using computer programming / modelling techniques.
- Object oriented programming, software modelling and structured programming techniques in formulating and solving engineering applications.
- Modular programming and data structures.
- Algorithm development for engineering applications.
- Computational numerical and statistical analysis of different engineering problems.

2. What level is this course?

300 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...	Competencies from multiple Professional Bodies (see below) *
1 Explain the role and application of computer programming and interactive modelling (and the use of computational numerical and statistical methods) to solve complex engineering problems.	Knowledgeable	2.1.a, 2.1.a, 2.1.b, 2.1.b, 2.1, 2.1
2 Explain the concepts of program flow control, memory management, arrays, unions and elementary data structures.	Knowledgeable	1, 1, 1.2.a, 1.2.a, 1.2, 1.2
3 Reflect on the operations and applications of engineering software (such as C/C++, MATLAB/SimuLink, LabView) in formulating, modelling and analysing wide range of physical engineering problems and applications.	Creative and critical thinker	2, 2, 2.2.b, 2.2.b, 2.2, 2.2
4 Analyse and interpret performance of the designed engineering algorithm / models with alterations of critical model parameters and the influence of external parameters on the performance of the designed model.	Creative and critical thinker	2, 2, 2.1.a, 2.1.a, 2.1.b, 2.1.b, 2.1.c, 2.1.c, 2.1, 2.1
5 Design and model a complex mechatronic process using available software tools to benefit industrial applications.	Empowered	2, 2, 2.2.a, 2.2.a, 2.3.b, 2.3.b, 2.2, 2.2
6 Develop and debug algorithms for engineering applications.	Empowered	2, 2, 2.2.a, 2.2.a, 2.2, 2.2

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 ENGINEERING TECHNOLOGIST COMPETENCY STANDARDS	
1	Elements of competency: Knowledge and Skill Base
1.2.a	Knowledge and Skill Base - Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the technology domain: Fluently applies relevant investigation, analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the technology domain.
1.2	Knowledge and Skill Base: Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the technology domain.

CODE	COMPETENCY
2.1.a	Engineering Application Ability - Application of established engineering methods to broadly-defined problem solving within the technology domain: Identifies, discerns and characterises salient issues, determines and analyses causes and effects, justifies and applies appropriate simplifying assumptions, predicts performance and behaviour, synthesises solution strategies and develops substantiated conclusions.
2.1.b	Engineering Application Ability - Application of established engineering methods to broadly-defined problem solving within the technology domain: Ensures that the application of specialist technologies are soundly based on fundamental principles by diagnosing, and taking appropriate action with data, calculations, results, proposals, processes, practices, and documented information that may be ill-founded, illogical, erroneous, unreliable or unrealistic.
2	Elements of competency: Engineering Application Ability
2.2.b	Engineering Application Ability - Application of engineering techniques, tools and resources within the technology domain: Understands the principles, limitations and accuracy of mathematical, physical or computational modelling.
2.1.c	Engineering Application Ability - Application of established engineering methods to broadly-defined problem solving within the technology domain: Within specialist practice area(s), competently addresses broadly-defined engineering technology problems which involve uncertainty, ambiguity, imprecise information and wide-ranging and sometimes conflicting technical and non-technical factors.
2.2.a	Engineering Application Ability - Application of engineering techniques, tools and resources within the technology domain: Proficiently identifies, selects and applies the materials, components, devices, systems, processes, resources, plant and equipment relevant to the technology domain.
2.3.b	Engineering Application Ability - Application of systematic synthesis and design processes within the technology domain: Accommodates contextual factors that impact the technology domain, and in particular to ensure that health, safety and sustainability imperatives are addressed as an integral part of the design process.
2.1	Engineering Application Ability: Application of established engineering methods to broadly-defined problem solving within the technology domain.
2.2	Engineering Application Ability: Application of engineering techniques, tools and resources within the technology domain.
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1	Elements of competency: Knowledge and Skill Base
1.2.a	Knowledge and Skill Base - Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline: Develops and fluently applies relevant investigation analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the engineering discipline.
1.2	Knowledge and Skill Base: Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.
2.1.a	Engineering Application Ability - Application of established engineering methods to complex engineering problem solving: Identifies, discerns and characterises salient issues, determines and analyses causes and effects, justifies and applies appropriate simplifying assumptions, predicts performance and behaviour, synthesises solution strategies and develops substantiated conclusions.
2.1.b	Engineering Application Ability - Application of established engineering methods to complex engineering problem solving: Ensures that all aspects of an engineering activity are soundly based on fundamental principles - by diagnosing, and taking appropriate action with data, calculations, results, proposals, processes, practices, and documented information that may be ill-founded, illogical, erroneous, unreliable or unrealistic.
2	Elements of competency: Engineering Application Ability
2.2.b	Engineering Application Ability - Fluent application of engineering techniques, tools and resources: Constructs or selects and applies from a qualitative description of a phenomenon, process, system, component or device a mathematical, physical or computational model based on fundamental scientific principles and justifiable simplifying assumptions.
2.1.c	Engineering Application Ability - Application of established engineering methods to complex engineering problem solving: Competently addresses complex engineering problems which involve uncertainty, ambiguity, imprecise information and wide-ranging and sometimes conflicting technical and non-technical factors.

CODE	COMPETENCY
2.2.a	Engineering Application Ability - Fluent application of engineering techniques, tools and resources: Proficiently identifies, selects and applies the materials, components, devices, systems, processes, resources, plant and equipment relevant to the engineering discipline.
2.3.b	Engineering Application Ability - Application of systematic engineering synthesis and design processes: Addresses broad contextual constraints such as social, cultural, environmental, commercial, legal political and human factors, as well as health, safety and sustainability imperatives as an integral part of the design process.
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.

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

ELC200

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

5.4. Specific assumed prior knowledge and skills (where applicable)

Not applicable

5.5. Microcredential Information

Not applicable

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

Early feedback will be provided through completion of weekly activities in workshops. Furthermore, feedback on each assessment will be provided which will be used to help with the following assessment.

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	Quiz/zes	Individual	20%	5 x quizzes	Refer to Format	Online Assignment Submission with plagiarism check
All	2	Practical / Laboratory Skills, and Written Piece	Individual	40%	2000 words	Week 8	Online Assignment Submission with plagiarism check
All	3	Oral and Written Piece	Individual	40%	10 minutes	Week 12	Online Assignment Submission with plagiarism check

All - Assessment Task 1: Quizzes

GOAL:	Relevant problems to enforce understanding of the students Assignments.
PRODUCT:	Quiz/zes
AUTHORSHIP STATEMENT:	
FORMAT:	Relevant problems to enforce understanding of the students Assignments. Weeks 4, 6, 8, 10, 12.
CRITERIA:	

No.		Learning Outcome assessed
1	Explanation of the role and application of computer programming and interactive modelling (and the use of computational numerical and statistical methods) to solve complex engineering problems.	1
2	Explanation of the concepts of program flow control, memory management, arrays, unions and elementary data structures.	2
3	Reflection on the operations and applications of engineering software (such as C/C++, MATLAB/SimuLink, LabView) in formulating, modelling and analysing wide range of physical engineering problems and applications.	3
4	Analysis and interpretation of performance of the designed engineering algorithm / models with alterations of critical model parameters and the influence of external parameters on the performance of the designed model.	4
5	Development and debugging of algorithms for engineering applications.	6

GENERIC SKILLS:	Problem solving, Applying technologies, Information literacy

All - Assessment Task 2: Laboratory Demonstration and Report

GOAL:	Experiment work on modelling and programming to verify students ability to apply the acquired knowledge and skills.
PRODUCT:	Practical / Laboratory Skills, and Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Experiment work on modelling and programming to verify students ability to apply the acquired knowledge and skills. Reports, demonstration
CRITERIA:	

No.		Learning Outcome assessed
1	Analysis and interpretation of performance of the designed engineering algorithm / models with alterations of critical model parameters and the influence of external parameters on the performance of the designed model.	4
2	Design and modelling of a complex mechatronic process using available software tools to benefit industrial applications.	5
3	Development and debugging of algorithms for engineering applications.	6

GENERIC SKILLS:	Communication, Problem solving, Organisation, Applying technologies

All - Assessment Task 3: Presentation

GOAL:	Explain the process used to identify and design the solution to the nominated problem.
PRODUCT:	Oral and Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Design exercises Reports, demonstrations / presentation

CRITERIA:

No.		Learning Outcome assessed
1	Explanation of the role and application of computer programming and interactive modelling (and the use of computational numerical and statistical methods) to solve complex engineering problems.	1
2	Explanation of the concepts of program flow control, memory management, arrays, unions and elementary data structures.	2
3	Reflection on the operations and applications of engineering software (such as C/C++, MATLAB/SimuLink, LabView) in formulating, modelling and analysing wide range of physical engineering problems and applications.	3
4	Analysis and interpretation of performance of the designed engineering algorithm / models with alterations of critical model parameters and the influence of external parameters on the performance of the designed model.	4
5	Design and modelling of a complex mechatronic process using available software tools to benefit industrial applications.	4
6	Development and debugging of algorithms for engineering applications.	6

GENERIC SKILLS:	Communication, Problem solving, Organisation

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

There are no required/recommended resources for this course.

8.2. Specific requirements

Not applicable

9. How are risks managed in this course?

Health and safety risks for this course have been assessed as low. It is 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:
(a) The final mark is in the percentage range 47% to 49.4%; and
(b) The course is graded using the Standard Grading scale

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 submissions may be penalised up to and including the following maximum percentage of the assessment task's identified value, with weekdays and weekends included in the calculation of days late:
(a) One day: deduct 5%;
(b) Two days: deduct 10%;
(c) Three days: deduct 20%;
(d) Four days: deduct 40%;
(e) Five days: deduct 60%;
(f) Six days: deduct 80%;
(g) Seven days: A result of zero is awarded for the assessment task.

The following penalties will apply for a late submission for an online examination:
Less than 15 minutes: No penalty
From 15 minutes to 30 minutes: 20% penalty
More than 30 minutes: 100% penalty

10.4. 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

10.5. 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.

10.6. General Enquiries

For course-specific questions, contact your teaching staff or Course Coordinator.

For other enquiries or to access support, please contact Student Central:

- UniSC Student Central
- UniSC Adelaide Student Central