COURSE OUTLINE

MCH501 Advanced Control Systems Engineering

School: School of Science, Technology and Engineering

2026 | Trimester 2

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.
Online	ONLINE	You can do this course without coming onto campus, unless your program has specified a mandatory onsite requirement.

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

This course has been designed to enhance your knowledge of advanced control system design. You will analyse automated, digital, and predictive control systems, and use control system software for real-time implementation. You will distinguish principles of control systems and apply them to engineering processes. Theoretical knowledge is complemented with projects simulating real-world scenarios, demonstrated through software like Matlab or Octave.

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
ONLINE			
Learning materials – Asynchronous weekly learning material	1hr	Week 1	12 times
Seminar – Online	1hr	Week 1	3 times
Tutorial/Workshop 1 – Online	2hrs	Week 1	10 times
Laboratory 1 – Online	2hrs	Week 2	5 times

1.3. Course Topics

Topics may include:

- Review of control system engineering including stability and steady state errors.
- Overview of transforms.
- Digital and discrete control system design and analysis.
- Predictive and adaptive control systems.
- Multivariable control.
- Design, modelling and real time realisation of different control systems using control software.

2. What level is this course?

500 Level (Advanced)

Engaging with new discipline knowledge and skills at an advanced level or deepening existing knowledge and skills within a discipline. Independent application of knowledge and skills in unfamiliar contexts.

3. What is the unit value of this course?

12 units

4. How does this course contribute to my learning?

COURSE LEARNING OUTCOMES On successful completion of this course, you should be able to...	GRADUATE QUALITIES MAPPING Completing these tasks successfully will contribute to you becoming...	PROFESSIONAL STANDARD MAPPING * Engineers Australia Stage 1 Professional Engineer Competency Standards
1 Demonstrate advanced knowledge of the theory and applications of control systems and controllers.	Knowledgeable	1, 1.3.a, 1.3
2 Demonstrate knowledge of different predictive and adaptive control systems designs	Knowledgeable	1, 1.3.a, 1.3
3 Transform and evaluate different control systems to synthesize and justify solutions for specific applications.	Creative and critical thinker	2, 2.1.a, 2.1
4 Design and evaluate various digital and discrete control systems for stability and performance to ensure relevant criteria are met.	Creative and critical thinker	2, 2.1.a, 2.1
5 Apply mathematical and theoretical knowledge to design and model an effective control system for a practical engineering process and perform real time realisation of the control system using control software	Empowered	2, 2.3.a, 2.3
6 Design and apply suitable automatic and multivariable control systems in order to automate an industrial engineering process.	Engaged	2, 2.3.a, 2.3
7 Critically evaluate advanced control methodologies and assess their broader applicability to industrial processes.	Knowledgeable Creative and critical thinker Empowered Communication Problem solving Applying technologies	2.1.d, 2.2.a, 3.2.a

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1	Elements of competency: Knowledge and Skill Base
1.3.a	Knowledge and Skill Base - In-depth understanding of specialist bodies of knowledge within the engineering discipline: Proficiently applies advanced technical knowledge and skills in at least one specialist practice domain of the engineering discipline.
1.3	Knowledge and Skill Base: In-depth understanding of specialist bodies of knowledge within the engineering discipline.
2	Elements of competency: Engineering Application Ability
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.
2.3.a	Engineering Application Ability - Application of systematic engineering synthesis and design processes: Proficiently applies technical knowledge and open ended problem solving skills as well as appropriate tools and resources to design components, elements, systems, plant, facilities and/or processes to satisfy user requirements.
2.1.d	Engineering Application Ability - Application of established engineering methods to complex engineering problem solving: Investigates complex problems using research-based knowledge and research methods.
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.
2.1	Engineering Application Ability: Application of established engineering methods to complex engineering problem solving.
2.3	Engineering Application Ability: Application of systematic engineering synthesis and design processes.
3.2.a	Professional and Personal Attributes - Effective oral and written communication in professional and lay domains: Is proficient in listening, speaking, reading and writing English.

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

Enrolled in MC003 or MC005 or MC006 or GC003 or GC005 or GC006 or GD003 or GD005 or GD006

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	Practical / Laboratory Skills, and Written Piece	Individual	30%	2000 words	Week 8	Online Assignment Submission with plagiarism check
All	2	Quiz/zes	Individual	10%	5 x Quizzes	Throughout teaching period (refer to Format)	Online Test (Quiz)
All	3	Examination - Centrally Scheduled	Individual	40%	2 hours	Exam Period	Online Assignment Submission with plagiarism check
All	4	Oral	Individual	20%	A 10-12 minute presentation which may be followed by approximately 5-10 minutes of questions.	Week 12	Online Submission

All - Assessment Task 1: Laboratory Analysis

GOAL:	Laboratory analysis of a control system.
PRODUCT:	Practical / Laboratory Skills, and Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Laboratory analysis of a control system.

CRITERIA:

No.		Learning Outcome assessed
1	Design, evaluation and critically analysis of various digital and discrete control systems for stability and performance to ensure relevant criteria are met.	4
2	Application of mathematical and theoretical knowledge to design and model an effective control system for a practical engineering process and perform real time realisation of the control system using control software	5
3	Design and application of suitable automatic and multivariable control systems in order to automate an industrial engineering process.	6
4	Demonstration of advanced knowledge of the theory and applications of control systems and controllers.	1
5	Demonstration of knowledge of different predictive and adaptive control systems designs	2

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

All - Assessment Task 2: Quizzes

GOAL:	Apply knowledge through practical tasks and problem solving.
PRODUCT:	Quiz/zes
AUTHORSHIP STATEMENT:	
FORMAT:	Application of knowledge through practical tasks and problem solving. Weeks 2, 4, 6, 8, 10.
CRITERIA:	

No.		Learning Outcome assessed
1	Demonstration of advanced knowledge of the theory and applications of control systems and controllers.	1
2	Demonstration of knowledge of different predictive and adaptive control systems designs	2

GENERIC SKILLS:	Problem solving, Organisation, Applying technologies, Information literacy

All - Assessment Task 3: Final Exam

GOAL:	Answer questions and problems related to the course contents.
PRODUCT:	Examination - Centrally Scheduled
AUTHORSHIP STATEMENT:	
FORMAT:	Questions and problems related to the course contents.
CRITERIA:	

No.		Learning Outcome assessed
1	Design, evaluation and critically analysis of various digital and discrete control systems for stability and performance to ensure relevant criteria are met.	4
2	Transformation and evaluation of different control systems to synthesize and justify solutions for specific applications.	3
3	Application of mathematical and theoretical knowledge to design and model an effective control system for a practical engineering process and perform real time realisation of the control system using control software	5
4	Demonstration of advanced knowledge of the theory and applications of control systems and controllers.	1
5	Demonstration of knowledge of different predictive and adaptive control systems designs	2

GENERIC SKILLS:	Problem solving, Applying technologies, Information literacy

All - Assessment Task 4: Course summary and critical evaluation

GOAL:	To assess your ability to critically evaluate advanced control methodologies and assess their broader applicability to industrial processes.
PRODUCT:	Oral
AUTHORSHIP STATEMENT:	
FORMAT:	Presentation
CRITERIA:	

No.		Learning Outcome assessed
1	Synthesis & Critical Evaluation: Integrated and insightful critiques of core course concepts and their interrelationships.	7
2	Clarity & Communication: Well-organised, engaging, and clear presentation, effectively using visuals to enhance understanding.	7
3	Engagement & Understanding: Accurate and thoughtful responses to questions, demonstrating deep understanding and critical thinking.	7

GENERIC SKILLS:	Communication, Problem solving

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

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