COURSE OUTLINE

MCH301 Mechatronic Design 2

School: School of Science, Technology and Engineering

2026 | Semester 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

This course will provide you with the knowledge, skills and understanding of developing integrated mechatronic systems. You will learn the design principles of key mechanical and electromechanical elements that constitute a mechatronic system. You will further learn synthesis of kinematic systems and simple power transmission elements. You will design and fabricate custom components to develop solutions for mechatronics design tasks. You will also program industry standard programmable logic controllers (PLC) in a mechatronics context.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – Asynchronous Learning Material	2hrs	Week 1	13 times
Seminar – Welcome and course introduction	1hr	Week 1	Once Only
Tutorial/Workshop 1 – Problem solving and discussion (2 hours x 10 weeks)	2hrs	Week 2	10 times
Laboratory 1 – Computer Lab (2 hours x Weeks 2,4,6,8,10,12) Workshop (2 hours x Weeks 5,7,9,11,13)	2hrs	Week 2	11 times

1.3. Course Topics

- Introduction to stress analysis and failure theories
- Physical elements of a mechatronics system (Gears, Springs, Shafts)
- Power transmission systems
- Machine synthesis
- Machine kinematic analysis
- Electromechanical sensors and actuators
- PLC Structure and Programming

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 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 Applies failure theories, stress and fatigue analysis to simple mechatronics elements	Empowered	1.2, 1.3, 1.5, 1.6
2 Design electromechanical machines / power transmission systems utilising machine elements	Creative and critical thinker	1.4, 2.2, 2.3, 2.4, 3.6
3 Select suitable electromechanical sensors and actuators for given industrial process automation conditions	Empowered	1.2, 1.3, 2.1, 2.2
4 Program PLC (Programmable Logic Controllers) to implement process automation for given tasks	Engaged	1.1, 1.3, 2.1, 2.2, 2.4
5 Communicates using mechatronics engineering terminology and symbols conforming to industry standards and formats.	Engaged	3.1, 3.2, 3.4, 3.5

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1.1	Knowledge and Skill Base: Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable 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.
1.3	Knowledge and Skill Base: In-depth understanding of specialist bodies of knowledge within the engineering discipline.
1.4	Knowledge and Skill Base: Discernment of knowledge development and research directions within the engineering discipline.
1.5	Knowledge and Skill Base: Knowledge of engineering design practice and contextual factors impacting the engineering discipline.
1.6	Knowledge and Skill Base: Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific 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.
2.3	Engineering Application Ability: Application of systematic engineering synthesis and design processes.
2.4	Engineering Application Ability: Application of systematic approaches to the conduct and management of engineering projects.
3.1	Professional and Personal Attributes: Ethical conduct and professional accountability.
3.2	Professional and Personal Attributes: Effective oral and written communication in professional and lay domains.
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.

CODE	COMPETENCY
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

MCH200

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

First assessment will be given early i.e. in week 3 with feedback.

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	Individual	30%	1500 words or equivalent in total.	Refer to Format	Online Assignment Submission with plagiarism check
All	2	Practical / Laboratory Skills, and Written Piece	Individual	30%	The lab reports will be about 1500 words in total with supporting materials i.e. figures/schematics, software files, and practical prototype if applicable.	Refer to Format	Online Assignment Submission with plagiarism check
All	3	Artefact - Technical and Scientific, and Written Piece	Group	40%	Project will be documented in approximately a 2000 word report with supporting materials (e.g. software files, videos, and live demonstrations) where applicable.	Week 13	Online Assignment Submission with plagiarism check and in class

All - Assessment Task 1: Written Assignments

GOAL:	The assignments will develop your knowledge and understanding of fundamental failure design theories, synthesis of mechatronic mechanisms, and PLC programming.
PRODUCT:	Artefact - Technical and Scientific, and Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Working individually, you will propose a solution in the form of written document with supporting figures, models, and/or codes. Submissions will be distributed throughout the semester (i.e. week 3 = 10% and week 7 = 20%).
CRITERIA:	

No.		Learning Outcome assessed
1	Application of stress analysis and failure theories to test physical viability of a mechatronics system.	1
2	Demonstration of effective PLC programming techniques for desired industry processes.	4

GENERIC SKILLS:	Problem solving, Applying technologies, Information literacy

All - Assessment Task 2: Practical and Computer Labs

GOAL:	This assessment will build you skills and knowledge in developing components, assembly models, component analysis, and prototyping. You will also learn to program PLCs (programmable logic controllers).
PRODUCT:	Practical / Laboratory Skills, and Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Lab report with relevant files, models, prototype. Submissions in (week 5 = 15% and week 11 = 15%.
CRITERIA:	

No.		Learning Outcome assessed
1	Demonstration of effective 3D modelling and prototyping skills to design mechatronic machines or its sub elements.	1 2
2	Proper setup of PLC hardware and software according to the requirements of task.	4
3	Professional presentation of design layouts and lab work in appropriate format.	5

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

All - Assessment Task 3: Design Project

GOAL:	Design project will give you the opportunity to apply mechatronics specific skills to design and build artefacts which meet the real-world inspired task.
PRODUCT:	Artefact - Technical and Scientific, and Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	In a written report format with physical prototype and demonstration where applicable.
CRITERIA:	

No.		Learning Outcome assessed
1	Analysis of design requirements and selection of suitable components.	2 3
2	Communication of ideas, methodology, and designs clearly and professionally in written and oral forms.	5

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

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

Students should have access to windows computer with internet access.

9. How are risks managed in this course?

Risk assessments have been performed for all studio and laboratory classes and a low level of health and safety risk exists. Some risk concerns may include equipment, instruments, and tools; as well as manual handling items within the laboratory. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the 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. 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

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