

MCH200 Mechatronic Design 1

School: School of Science, Technology and Engineering

2023 | Semester 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.

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

We live in a world of change with advances in technology and automation regularly producing new products and ways of interacting with them. Mechatronic engineering is at the forefront of these advances. This course will develop your knowledge and technical skills in conceptualising, designing, and building products that respond to a variety of consumer and industry requirements. The content builds on foundational concepts from ENG103 and ENG104 through a hands-on approach to design methodology, solid modelling, computer programming, and electric circuits in simple mechatronic devices.

1.2. How will this course be delivered?

| ACTIVITY | HOURS | BEGINNING WEEK | FREQUENCY |
|---|-------|----------------|-----------|
| BLENDED LEARNING | | | |
| Learning materials – asynchronous learning materials | 1hr | Week 1 | 12 times |
| Laboratory 1 – On campus Computer Lab Weeks 3,5,7,9,11 | 2hrs | Week 3 | 5 times |
| Tutorial/Workshop 1 – On campus Weeks 2,4,6,8,10,12 | 2hrs | Week 2 | 6 times |
| Tutorial/Workshop 2 – On campus tutorial | 1hr | Week 1 | 13 times |

1.3. Course Topics

- Introduction to mechatronics systems and design
- Electrical circuit analysis
- Signal amplification and switching circuits
- Sensors and Transducers
- Actuation
- Conditioning and interfacing
- Physical system modeling
- Signals, systems and controls
- Microcontroller and programming
- 3D Solid Modeling

2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

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 Select appropriate theory and design methodologies to design simple mechatronic devices. | Knowledgeable | 1.1, 1.2 |
| 2 Demonstrate solid modelling techniques and skills to illustrate components and assemblies of simple mechatronic systems and present these in engineering drawings. | Empowered | 1.5, 2.2 |
| 3 Analyse design requirements and select most suitable components from manufacturers' catalogues. | Creative and critical thinker | 1.6, 2.2 |
| 4 Work collaboratively in teams to design components and simple machines to meet specified requirements. | Empowered | 1.3, 3.6 |
| 5 Apply theory and knowledge to solve real life mechatronic problems. | Engaged | 2.1, 2.3, 3.3 |
| 6 Communicate ideas and designs using appropriate engineering terminology, symbols and illustrations. | Knowledgeable | 3.2 |

* 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. |
| 1.5 | 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. |

| CODE | COMPETENCY |
|------|---|
| 3.2 | Professional and Personal Attributes: Effective oral and written communication in professional and lay domains. |
| 3.3 | Professional and Personal Attributes: Creative, innovative and pro-active demeanour. |
| 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

ENG104

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

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

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

Performance and feedback from class exercises and projects will demonstrate the level of proficiency and understanding of the course material.

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% | Maximum 1500 words (or as stated) | Throughout teaching period (refer to Format) | Online Assignment Submission with plagiarism check |
| All | 2 | Practical / Laboratory Skills | Individual | 35% | The lab report will be about 1500 words long including figures/schematics. | Week 10 | Online Assignment Submission with plagiarism check |
| All | 3 | Artefact - Technical and Scientific, and Written Piece | Group | 35% | Project will be documented in a report of about 2000 words. | Week 13 | Online Assignment Submission with plagiarism check |

All - Assessment Task 1: Assignment

| | | |
|------------------|---|--|
| GOAL: | The assignment will develop your knowledge and understanding of fundamental design methodologies and the underlying mechanical and electronic design theories and their applications. The assignments will further give students the opportunity to bring together course specific knowledge to propose solution for mechatronic design problems. | |
| PRODUCT: | Artefact - Technical and Scientific, and Written Piece | |
| FORMAT: | For each assignment you are required to work individually and propose a solution in the form of written document (about 500 words each) with supporting figures, models, and/or codes. Submissions will be distributed throughout the semester (i.e. weeks 3, 6, and 9) | |
| CRITERIA: | No. | Learning Outcome assessed |
| | 1 | Demonstration of knowledge and application of theories in simple mechatronics systems; 1 |
| | 2 | Application of theory and knowledge to solve real life mechatronic problems; 5 |
| | 3 | Analysis of design requirements and selection of the most suitable components from manufacturers' catalogues for the design and development of a simple mechatronic device 3 |
| | 4 | Communication of design and solutions using appropriate engineering terminology, symbols and diagrams. 6 |

All - Assessment Task 2: Practical and computer lab skills

| | | |
|------------------|---|--|
| GOAL: | This assessment will build you skills and knowledge in programming microcontroller interfaced mechatronics systems. Moreover, you will work on solid models and associated engineering designs to model and fabricate parts to aid such systems (e.g. mobile robots). | |
| PRODUCT: | Practical / Laboratory Skills | |
| FORMAT: | Lab tasks should be submitted in the form of a collective report of about 1500 words with relevant files of programming script and/or 3D models/assembly. | |
| CRITERIA: | No. | Learning Outcome assessed |
| | 1 | Demonstration of efficient and effective 3D solid modelling techniques and skills to develop models of components and assemblies 2 |
| | 2 | Presentation of engineering drawings, using the appropriate format, symbols and projection standards. 6 |
| | 3 | Communication of design specifications using appropriate engineering terminology, symbols and diagrams. 6 |
| | 4 | Application of programming and interfacing techniques to solve relevant tasks at hand. 5 |

All - Assessment Task 3: Design Project

| | | |
|-----------------|---|--|
| GOAL: | The project is designed as a hands-on activity to build your skills to be creative, innovate, apply design methodology, and build artefacts which meet the proposed design brief. | |
| PRODUCT: | Artefact - Technical and Scientific, and Written Piece | |
| FORMAT: | Project will be documented in a report and is submitted along with supporting files and demonstrations. Selected projects will be displayed in the school or at an appropriate event. | |

| CRITERIA: | No. | Learning Outcome assessed |
|-----------|-----|---|
| | 1 | Selection of appropriate theory and design methodologies to design and build simple mechatronic devices 1 5 |
| | 2 | Analysis of design requirements and selection of most suitable components 3 |
| | 3 | Performance of designed device against design criteria 5 |
| | 4 | Communication of ideas and designs clearly and fluently, in both written and spoken forms 6 |
| | 5 | Demonstration of ability to work collaboratively in teams to design components and simple machines to meet specified requirements. 4 |

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 | W. Bolton | 2018 | Mechatronics | 7 | Pearson |

8.2. Specific requirements

Fully enclosed shoes must be worn in the engineering laboratory. If you do not have the correct shoes you will not be allowed to do the practical. You must also undertake the laboratory induction before you can undertake any practical.

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:

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