COURSE OUTLINE

ELC400 Robotics and Autonomous Systems

School: School of Science, Technology and Engineering

2023 | 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 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

The utilisation of robotics and autonomous systems is playing a major role in improving society and industries. An example is the recent trend towards autonomous vehicles. This course will help you to learn about the principles, design, and implementation of robotics and autonomous systems including robotic programming, sensing, path planning and control, including concepts such as the design principles of mobile robots, AI control, ethical aspects of robotic autonomous systems, etc. This course will provide you hands-on experience to design, analyze and evaluate robotic autonomous systems.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – Asynchronous learning materials	1hr	Week 1	13 times
Laboratory 1 – On campus	2hrs	Week 1	4 times
Tutorial/Workshop 1 – On campus	2hrs	Week 2	10 times
Seminar – On campus	1hr	Week 1	Once Only

1.3. Course Topics

- Robot programming principles
- Sensing for robots
- Path planning and control
- Sensor and actuation devices
- Introduction to AI swarm and control
- Mobile robots
- Ethical aspects of robotic autonomous systems

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 Investigate the operation and design principle of robotics and autonomous systems based on the underlying theories and design considerations	Creative and critical thinker	1.3, 2.3, 3.2, 3.6
2 Solve design problems associated with the integration of robotic components, sensors, actuator devices and associated electronic devices into an autonomous robotic system	Empowered	1.1, 1.2, 2.1, 3.2
3 Demonstrate knowledge and apply theories in design, control and pathfinding algorithms in robotics and autonomous systems	Knowledgeable	1.1, 1.2, 2.1, 3.2
4 Communicate robotic autonomous systems using appropriate engineering terminology, symbols and diagrams	Engaged	1.1, 2.3, 3.2
5 Work collaboratively in teams to design robotic and autonomous system to meet specified requirements	Empowered	1.1, 2.1, 3.2, 3.6

* 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.
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	Professional and Personal Attributes: Effective oral and written communication in professional and lay domains.
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

ELC304

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

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	Portfolio	Group	30%	Each task is to be documented in a report and submitted in a group (maximum page limit of 15 pages. Each student writes approximately 1000 words and groups of 4-5.	Throughout teaching period (refer to Format)	In Class
All	2	Artefact - Technical and Scientific, and Written Piece	Group	30%	The project-based design / case study report is to be written with a maximum page limit of 10 pages. Each student writes approximately 1000 words.	Week 11	Online Assignment Submission with plagiarism check
All	3	Examination - Centrally Scheduled	Individual	40%	2 hours	Exam Period	Exam Venue

All - Assessment Task 1: Report

GOAL:	Through this task, the students develop understanding on the underlying theories and operational principles of robotics and autonomous systems. The students will carry out studies and implementations using hardware and robotic components to validate their theoretical understandings on the emerging topics in modern robotic and autonomous systems
PRODUCT:	Portfolio
FORMAT:	Reports describing and critically analyzing the simulation tasks. Each task is required to be documented as written reports and submitted in a group. Submit in weeks 4, 7, 10
CRITERIA:	

No.		Learning Outcome assessed
1	Investigation of the operation and design principle of robotics and autonomous systems based on the underlying theories and design considerations	1
2	Solutions to design problems associated with the integration of robotic components, sensors, actuator devices and associated electronic devices into an autonomous robotic system	2
3	Collaboration in teams to design robotic and autonomous system to meet specified requirements	5

All - Assessment Task 2: Project-Based Case Study

GOAL:	This task will develop critical thinking and analyzing ability of the students to formulate, design and evaluate performance of robotic system with collaboration utilizing the appropriate industry hardware and components.
PRODUCT:	Artefact - Technical and Scientific, and Written Piece
FORMAT:	A professional engineering report, which documents analytical solutions and/or software simulations.
CRITERIA:	

No.		Learning Outcome assessed
1	Investigation of the operation and design principle of robotics and autonomous systems based on the underlying theories and design considerations	1
2	Demonstration of knowledge and application of theories in design, control and pathfinding algorithms in robotics and autonomous systems	3
3	Communication of robotic autonomous systems using appropriate engineering terminology, symbols and diagrams	4

All - Assessment Task 3: Final Exam

GOAL:	The final exam will develop your ability to independently apply your skills and knowledge to solve familiar problem-based questions with confidence within a set time limit and without access to additional resources.
PRODUCT:	Examination - Centrally Scheduled
FORMAT:	Centrally scheduled 2 hour closed book examination

CRITERIA:	No.		Learning Outcome assessed
	1	Investigation of the operation and design principle of robotics and autonomous systems based on the underlying theories and design considerations	1
	2	Solutions to design problems associated with the integration of robotic components, sensors, actuator devices and associated electronic devices into an autonomous robotic system	2
	3	Communication of robotic autonomous systems using appropriate engineering terminology, symbols and diagrams	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.

7.1. Schedule

PERIOD AND TOPIC	ACTIVITIES
n/a	n/a

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?

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:
a) The final mark is in the percentage range 47% to 49.4%
b) The course is graded using the Standard Grading scale
c) 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 or using the SafeZone app. For general enquires contact the SafeUniSC team by phone 07 5456 3864 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 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