COURSE OUTLINE

MCH400 Image Processing and Machine Vision

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

Machine vision has recently become an integral part of the mechatronics field, enabling robots to interact with their surroundings through image analysis and interpretation. In this hands-on course, you will be introduced to the principles of image processing and machine learning methods. You will gain the knowledge required to implement vision-based algorithms using industry-standard software such as Matlab and Python. The course will cover methods that can be applied to both robotic and industrial applications.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – Asynchronous course content, videos, reference material	2hrs	Week 1	12 times
Tutorial/Workshop 1 – On campus: Problem solving and discussion	1hr	Week 1	12 times
Tutorial/Workshop 2 – On campus: Computer labs	2hrs	Week 2	11 times
Seminar – On campus: Welcome and course description	1hr	Week 1	Once Only

1.3. Course Topics

Topics may include:

- Introduction to image processing and vision
- Image processing techniques
- Histograms, thresholding, and filtering
- Image segmentation and classification
- Edge detection and feature extraction
- Principles of machine learning
- Supervised training
- Model training and interpretation
- Robotics and Vision based applications

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 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 theoretical knowledge in image processing and machine vision techniques.	Knowledgeable	1, 1.1, 1.2, 1.3
2 Evaluate given tasks in image processing and machine vision.	Creative and critical thinker	2, 2.1, 2.2, 2.3
3 Apply suitable software-based algorithms to implement image processing and machine vision techniques.	Empowered	1, 1.3, 1.4, 2, 2.1, 3, 3.2, 3.3
4 Design a solution to a given image processing task by selecting, evaluating, and developing suitable algorithms/methods.	Empowered	2, 2.1, 2.2, 2.3, 3, 3.3
5 Communicate professionally using mechatronics engineering terminology and symbols conforming to industry standards and formats.	Engaged	3, 3.2
6 Work collaboratively in teams to develop vision-based solution including communicating with team members, planning, and managing tasks.	Engaged	3, 3.2, 3.6

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1	Elements of competency: Knowledge and Skill Base
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.
2	Elements of competency: Engineering Application Ability
2.1	Engineering Application Ability: Application of established engineering methods to complex engineering problem solving.

CODE	COMPETENCY
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.
3	Elements of competency: Professional and Personal Attributes
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

Enrolled in GC004, GD004, MC004, GC006, GD006, MC006, SC404, SC405, SC410 or SC411.

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 to the students in week 3. The feedback on this assessment will assist students in modifying their subsequent assessments later in the trimester.

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%	2000 to 3000 words	Week 6	Online Assignment Submission with plagiarism check
All	2	Artefact - Technical and Scientific, and Written Piece	Individual	30%	1500 words + 5-10 minutes video	Week 10	Online Assignment Submission with plagiarism check and in class
All	3	Artefact - Technical and Scientific, and Written Piece	Group	40%	Project based design report accompanied with code is to be submitted with an equivalent word length of about 2500 words. Practical implementation may also be required.	Week 12	Online Assignment Submission with plagiarism check

All - Assessment Task 1: Project-Based Case Studies

GOAL:	The assignment will develop your knowledge and understanding of image processing and machine vision techniques. You will solve problems and propose algorithms related to topics like images as functions, thresholding, filtering, edge detection, Hough transforms, convolution, illumination, stereo vision etc. All these topics and content are developed during the workshops.
PRODUCT:	Artefact - Technical and Scientific, and Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Relevant tasks and problems to enforce understanding of the students and help in gradual development of knowledge and skills throughout the course.
CRITERIA:	

No.		Learning Outcome assessed
1	Demonstration of theoretical knowledge in image processing and machine vision techniques.	1
2	Evaluate given tasks in image processing and machine vision.	2
3	Design a solution to a given image processing task by selecting, evaluating, and developing suitable algorithms/methods.	4
4	Communicate professionally using mechatronics engineering terminology and symbols conforming to industry standards and formats.	5

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

All - Assessment Task 2: Project-Based Case Studies

GOAL:	This assessment will build you skills and knowledge in developing and implementing image processing and machine vision techniques using industry standard software (e.g. MatLab, Python). You will test established codes and modify/develop machine vision codes for given problems. All these topics and content are developed during the workshops.
PRODUCT:	Artefact - Technical and Scientific, and Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Working individually, you will develop and implement software codes and submit with accompanying explanation and supporting material (text, images, flowhcarts). This will involve both a report and a short video presentation.
CRITERIA:	

No.		Learning Outcome assessed
1	Demonstrate theoretical knowledge in image processing and machine vision techniques.	1
2	Evaluate given tasks in image processing and machine vision.	2
3	Apply suitable software-based algorithms to implement image processing and machine vision techniques.	3
4	Communicate professionally using mechatronics engineering terminology and symbols conforming to industry standards and formats.	5

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

All - Assessment Task 3: Project

GOAL:	The design project will give you an opportunity to use the skills learnt during the course. You would need to apply vision techniques to solve a loosely defined design requirement set in real-world context.
PRODUCT:	Artefact - Technical and Scientific, and Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Working in groups, you will submit your design solution with supporting material (text, images, flowcharts). Software and hardware implementation may be required to demonstrate project performance.
CRITERIA:	

No.		Learning Outcome assessed
1	Apply suitable software-based algorithms to implement image processing and machine vision techniques.	3
2	Design a solution to a given image processing task by selecting, evaluating, and developing suitable algorithms/methods.	4
3	Communicate professionally using mechatronics engineering terminology and symbols conforming to industry standards and formats.	5
4	Work collaboratively in teams to develop vision-based solution including communicating with team members, planning, and managing tasks.	6

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

You need regular access to the resource(s) below. Many texts are available as ebooks through the Library at no additional cost.

REQUIRED?	AUTHOR	YEAR	TITLE	EDITION	PUBLISHER
Recommended	Rafael C. Gonzalez,Richard E. Woods	2017	Digital Image Processing, Global Edition	or Latest	Pearson Higher Education
Recommended	David Forsyth,Jean Ponce	2012	Computer Vision	n/a	Prentice Hall
Recommended	Ravishankar Chityala,Sridevi Pudipeddi	2022	Image Processing and Acquisition Using Python	n/a	CRC Press
Recommended	Rafael C. Gonzalez,Richard E. Woods,Steven L. Eddins	0	Digital Image Processing Using MATLAB	n/a	n/a

8.2. Specific requirements

Computer/laptop capable of running Python 3 or similar. The computer should have enough computing power to run MatLab if required. USB drive will be required to attach cameras and/or programming boards. In some cases webcam/external camera may also be required.

9. How are risks managed in this course?

Risk assessments have been conducted for the field activities being undertaken and a high level of risk has been identified. High level risk may include, boating, diving, and hot works such as welding, cutting and grinding. Where high risks exist you will be given training and advice about how to control the high level risk, however it is also 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