UNSW Course Outline

MTRN4231 Robotics Project - 2024

Published on the 29 Aug 2024

General Course Information

Course Code : MTRN4231
Year : 2024
Term : Term 3
Teaching Period : T3
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Mechanical and Manufacturing Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Postgraduate, Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course introduces students to the implementation of communications for robotic systems, and introduces tools such as machine vision and path planning for practical robotics. It has a focus on industrial applications, including end effectors. It has a major project component where students work in groups to implement a robotic solution involving one manipulator in a practical

application. This course will encourage students to improve their problem solving, project management and group work skills as a foundation for graduate positions.

Students enrolling in this course are assumed to have an understanding of inverse and forward kinematics, robotic manipulators and end effectors, and the evaluation of robo performance (all from MTRN4230). In addition, students are assumed to be fluent in project management practices and have experience with project-based teamwork from previous courses.

Course Aims

O1: Demonstrate the advantages of using software frameworks for robot system design, development and integration.

O2: Encourage the practical application of management, systems engineering and teamwork skills through a group project.

O3: Provide an environment in which a robot manipulator and vision system can be designed, integrated, evaluated and documented to a professional level.

Relationship to Other Courses

Requires MTRN4230 as a pre-requisite.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Design and produce a solution to a complex robotic system design problem using computer vision, a robotics programming framework and embedded systems.
CLO2 : Articulate and convey project justification and details through technical reports, presentations and videos
CLO5 : Apply systematic approaches to the management and execution of a complex engineering project in a small team
CLO6 : Reflect on the group-based engineering process.
CLO7 : Develop robotics control and communication software using a robotics programming framework (such as ROS2) that integrates machine vision

Course Learning Outcomes	Assessment Item
CLO1 : Design and produce a solution to a complex robotic system design problem using computer vision, a robotics programming framework and embedded systems.	• Final Group Demonstration • Group Design Report • Customer meetings • Personal Design and Reflection Journal
CLO2 : Articulate and convey project justification and details through technical reports, presentations and videos	• Final Group Demonstration • Group Design Report • Customer meetings
CLO5 : Apply systematic approaches to the management and execution of a complex engineering project in a small team	• ROS Task • Personal Design and Reflection Journal • Group Design Report • Customer meetings
CLO6 : Reflect on the group-based engineering process.	• Personal Design and Reflection Journal
CLO7 : Develop robotics control and communication software using a robotics programming framework (such as ROS2) that integrates machine vision	• ROS Task • Final Group Demonstration • Customer meetings

Learning and Teaching Technologies

Moodle - Learning Management System | EdStem

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
ROS Task Assessment Format: Individual	15%	Due Date: 5pm Fri Week 5
Final Group Demonstration Assessment Format: Group	30%	Due Date: Week 10: 11 November - 17 November
Group Design Report Assessment Format: Group	20%	Due Date: 5pm Fri Week 11
Customer meetings Assessment Format: Group	20%	Due Date: Week 4: 30 September - 06 October, Week 8: 28 October - 03 November
Personal Design and Reflection Journal Assessment Format: Individual	15%	Due Date: 5pm Fri Weeks 3, 7, 10

Assessment Details

ROS Task

Assessment Overview

This is an individual task to be undertaken at home. The students will be given a design brief and required to produce code that solves the problem, using ROS (robotics operating system).

Submissions will be marked according to their functionality, with a detailed marking guide given to students in advance. Solutions should be less than 500 lines of code. Group feedback will be given to the whole course, and individual feedback will be given where appropriate.

Course Learning Outcomes

- CLO5 : Apply systematic approaches to the management and execution of a complex engineering project in a small team
- CLO7 : Develop robotics control and communication software using a robotics programming framework (such as ROS2) that integrates machine vision

Assessment Length

less than 500 lines of code

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

Assistance with Attribution

This assessment requires you to write/create a first iteration of your submission yourself. You are then permitted to use generative AI tools, software or services to improve your submission in the ways set out below.
Any output of generative AI tools, software or services that is used within your assessment must be attributed with full referencing.
If outputs of generative AI tools, software or services form part of your submission and are not appropriately attributed, your Convenor will determine whether the omission is significant. If so, you may be asked to explain your submission. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.
For more information on Generative AI and permitted use please see here.

The majority of your submission should be your work. You may choose to use GenAI to help you write the code, but any GenAI contributions must be clearly marked using inline comments and using a header comment at the top of the relevant file.

Final Group Demonstration

Assessment Overview

The major project will be a central theme throughout the course and expose students to current visualisation software packages and real hardware. The project will be open ended, targeted at a problem derived from a professional or service robotics environment, using a custom-built robot manipulator in conjunction with an imaging system. Students will work in groups to produce requirements, define specifications, write test plans, implement a solution, verify and validate the solution and present the results to the class.

Groups will have approximately 20 minutes to present their finished solution and to demonstrate the robot's function. The presentation will be assessed by staff using a pre-published rubric, and group-level feedback will be given after the presentation. The group's presentation mark will be individually weighted using peer evaluation undertaken through Moodle.

Course Learning Outcomes

- CLO1 : Design and produce a solution to a complex robotic system design problem using computer vision, a robotics programming framework and embedded systems.
- CLO2 : Articulate and convey project justification and details through technical reports, presentations and videos
- CLO7 : Develop robotics control and communication software using a robotics programming framework (such as ROS2) that integrates machine vision

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

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For more information on Generative AI and permitted use please see here.

You may use GenAI to assist with writing code. Any AI-generated code should be marked inline with a comment and attributed in a comment in the header of the relevant file.

Group Design Report

Assessment Overview

A design report about the group's robotic system. It should detail the decisions made in the design and information about the capabilities and performance of the system.

The design report will be marked by the academic staff using a pre-published rubric. Feedback on the report will be given to each group. The group design report mark will be individually weighted using peer evaluation undertaken through Moodle.

Course Learning Outcomes

- CLO1 : Design and produce a solution to a complex robotic system design problem using computer vision, a robotics programming framework and embedded systems.
- CLO2 : Articulate and convey project justification and details through technical reports, presentations and videos
- CLO5 : Apply systematic approaches to the management and execution of a complex engineering project in a small team

Assessment Length

Approx. 20 pages

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
For more information on Generative AI and permitted use please see here.

Customer meetings

Assessment Overview

The customer meetings will be used to 'check in' on progress toward the final project goal.

The students will be required to submit relevant documentation (5-10 pages) in advance of each meeting, and to present the work to the lab demonstrators during their lab session.The rubric will be provided to the students in advance. The lab demonstrators will give verbal feedback to the group during their assessment.

Course Learning Outcomes

- CLO1 : Design and produce a solution to a complex robotic system design problem using computer vision, a robotics programming framework and embedded systems.
- CLO2 : Articulate and convey project justification and details through technical reports, presentations and videos
- CLO5 : Apply systematic approaches to the management and execution of a complex engineering project in a small team
- CLO7 : Develop robotics control and communication software using a robotics programming framework (such as ROS2) that integrates machine vision

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are

not permitted to use any generative AI tools, software or service to search for or generate information or answers.
For more information on Generative AI and permitted use please see here.

Personal Design and Reflection Journal

Assessment Overview

This is a personal journal used to detail design steps and to reflect on the group-based engineering process.

This is broken down into three sub-reports, each expected to be between 800-1200 words. They will be marked via a rubric, given to the students. Generalised feedback will be given to the whole class and individual feedback will be given where apropriate.

Course Learning Outcomes

- CLO1 : Design and produce a solution to a complex robotic system design problem using computer vision, a robotics programming framework and embedded systems.
- CLO5 : Apply systematic approaches to the management and execution of a complex engineering project in a small team
- CLO6 : Reflect on the group-based engineering process.

Assessment Length

2 pages

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

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For more information on Generative AI and permitted use please see here.

General Assessment Information

Grading Basis

Standard

Course Schedule

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Resources

Course Evaluation and Development

Feedback is gathered from students during the term using an online form. This feedback is acted on immediately, where possible, or implemented in future iterations of the course.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Will Midgley					No	Yes

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance

- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit:

student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,

- Pass/Fail assessment tasks.

Faculty-specific Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School-specific Information

Short Extensions

Short extensions are not currently applicable to Mechanical and Manufacturing Engineering Courses.

Review of Results

If you believe that there has been a marking error, you can request a review of results. Review of results cannot be used to get feedback.

If you would like feedback for assessments, you are welcome to contact the course convenor directly.

Use of AI

The use of AI is prohibited unless explicitly permitted by the course convenor. Please respect this and be aware that penalties will apply when unauthorised use is detected, such as through Turnitin. If the use of generative AI, such as ChatGPT, is allowed in a specific assessment, they must be properly credited, and your submissions must be substantially your own work.

Final Exam in Exam Period

For courses with a centrally timetabled final exam, students must be available for the entire exam period from Mon-Sat until your exact exam date is confirmed.

School Contact Information

Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

Hours

9:00–5:00pm, Monday–Friday*

*Closed on public holidays, School scheduled events and University Shutdown

Web

School of Mechanical and Manufacturing Engineering

Engineering Student Support Services

Engineering Industrial Training

UNSW Study Abroad and Exchange (for inbound students)

UNSW Future Students

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office**

**Please note that the School Office will not know when/if your course convenor is on campus or available

Email

Engineering Student Support Services – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

School Office – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries. The School will only be able to refer students on to the relevant team if contacted

Important Links

- Student Wellbeing
- Urgent Mental Health & Support
- Equitable Learning Services
- Faculty Transitional Arrangements for COVID-19
- Moodle
- Lab Access
- Computing Facilities
- Student Resources
- Course Outlines
- Makerspace
- UNSW Timetable
- UNSW Handbook