UNSW Course Outline

MTRN2500 Computing for Mechatronic Engineers - 2024

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General Course Information

Course Code : MTRN2500
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 : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course will teach students C++ programming in a mechatronic engineering context where interfacing with external devices is needed.

The courses in the Mechatronics discipline are built upon four different areas. They are: mechanical design, computing, electronics and microprocessors, and control systems. The latter three areas are interrelated, and this course forms a cornerstone of the fundamental courses on which the Mechatronic Engineering program at UNSW is built. A high level of programming skill is necessary to develop customised interface routines to communicate with/control various elements of Mechatronic systems. This knowledge is essential in programming control systems and developing software modules for the interfacing of various hardware elements together to form complete Mechatronic Systems.

Students enrolling in this course are expected to have a fundamental understanding of procedural programming, exposure to version control systems and experience with software design to the level expected in COMP1511 and COMP1531.

Course Aims

1. Learning modern C++ programming language.
2. Developing C++ programs to implement mechatronic systems.
3. Introducing object-oriented concepts in software development.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Demonstrate effective use of C++ programming to solve problems in relation to Mechatronic applications
CLO2 : Recognise and follow modern best practices in C++ programming
CLO3 : Explain the concepts within Object-Oriented Programming and apply these concepts to C++ program design
CLO4 : Execute version control toolsets effectively for code management and collaboration
CLO5 : Generate interfaces for an external device through a computer program to effect control action.

Course Learning Outcomes	Assessment Item
CLO1 : Demonstrate effective use of C++ programming to solve problems in relation to Mechatronic applications	• Tests • Individual Projects
CLO2 : Recognise and follow modern best practices in C++ programming	• Tests • Individual Projects
CLO3 : Explain the concepts within Object-Oriented Programming and apply these concepts to C++ program design	• Tests • Individual Projects
CLO4 : Execute version control toolsets effectively for code management and collaboration	• Individual Projects
CLO5 : Generate interfaces for an external device through a computer program to effect control action.	• Individual Projects

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360 | EdStem

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Tests Assessment Format: Individual	45%	Start Date: Not Applicable Due Date: Not Applicable
Individual Projects Assessment Format: Individual	55%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Tests

Assessment Overview

There will be one mid-term test, one end-term test, and weekly labs:

1. The mid-term test (20% of the overall course marks) will be in Week 5. The examined content will be based on the content covered in Weeks 1-4;

2. The end-term test (20% of the overall course marks) will be in Week 10. The examined content will be based on the content covered in Weeks 1-4 & 7-9;

3. The weekly labs (5% of the overall course marks) will be assessed during the labs in Weeks 1-4 & 7-9. The examined content will be based on the content covered in the same week.

Course Learning Outcomes

- CLO1 : Demonstrate effective use of C++ programming to solve problems in relation to Mechatronic applications
- CLO2 : Recognise and follow modern best practices in C++ programming
- CLO3 : Explain the concepts within Object-Oriented Programming and apply these concepts to C++ program design

Detailed Assessment Description

The mid-term and end-term tests will be during the Wednesday Lecture time in Weeks 5 and 10, respectively. Both tests will be in-person and invigilated. Marks will be returned within two weeks past the due date.

The seven labs scheduled for Weeks 1-4 and 7-9 will be evaluated based on the completion quality and attendance. Students are required to attend and complete at least five labs. If a student attends and completes more than five labs, their final Lab Marks (5%) will be based on the five labs with the highest scores. Special consideration should ONLY be requested if it is the third or more missed lab.

Assignment submission Turnitin type

This is not a Turnitin assignment

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.

Individual Projects

Assessment Overview

Two individual projects on using C++ for problem-solving in mechatronics:

1. The first individual project (22% of the overall course marks) will be released at 17:00 Monday Week 3 and due by 13:00 Monday Week 7.

2. The second individual project (33% of the overall course marks) will be released at 17:00 Monday Week 8 and due by 13:00 Monday Week 12.

Course Learning Outcomes

- CLO1 : Demonstrate effective use of C++ programming to solve problems in relation to Mechatronic applications
- CLO2 : Recognise and follow modern best practices in C++ programming
- CLO3 : Explain the concepts within Object-Oriented Programming and apply these concepts to C++ program design
- CLO4 : Execute version control toolsets effectively for code management and collaboration
- CLO5 : Generate interfaces for an external device through a computer program to effect control action.

Detailed Assessment Description

Please refer to the assignment specifications for more detailed descriptions and marking criteria. Marks of the first assignment will be returned within 2 weeks after the due date. Marks of the second assignment will be released along with the final course results.

Assignment submission Turnitin type

This is not a Turnitin assignment

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.

General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Introduction, C++ Basics I (hello world, building, types, names, declaration, initialisation, literals, type conversion, auto) C++ Basics II (std::cin, const, constexpr, scope, namespace, conditionals, range-for, scope, functions, default arguments, function overloading)
Week 2 : 16 September - 22 September	Lecture	Classes I (class definition and instantiation, structs, dot operator, constructors, getters and setters, const member function, this keyword, header guards) Enum (unscoped and scoped), STL I (std::string, std::array, std::vector, std::pair, std::tuple)
Week 3 : 23 September - 29 September	Lecture	Memory (pointers, references, dynamic memory allocation, destructors, smart pointers) Classes II (operator overloading, copy, move)
Week 4 : 30 September - 6 October	Lecture	STL II (containers, iterators, algorithms) Exception handling, I/O (I/O streams, formatting, file I/O, string streams)
Week 5 : 7 October - 13 October	Assessment	Mid-Term Quiz
Week 6 : 14 October - 20 October	Fieldwork	Industry Visit
Week 7 : 21 October - 27 October	Lecture	Inheritance (Base class and Derived class, Inheritance access specifier, Constructor parameter pass-through, Data and function overriding, Class hierarchy) Webots I
Week 8 : 28 October - 3 November	Lecture	Polymorphism (Substitution, Virtual functions, Polymorphism via virtual functions, Virtual destructor) Webots II
Week 9 : 4 November - 10 November	Lecture	Generic Programming (Function template, Class template) Webots III/ Contingency
Week 10 : 11 November - 17 November	Assessment	Revision End-Term Quiz

Attendance Requirements

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

Course Resources

Recommended Resources

There will be no textbook required for this course. Online resources for C++ programming will be provided.

- UNSW Library website: https://www.library.unsw.edu.au/
- Moodle: https://moodle.telt.unsw.edu.au/login/index.php
- Online resources:
  - https://www.learncpp.com/
  - https://en.cppreference.com/

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Leo Wu		301C, J17	02 93856548	Email to organise a meeting	Yes	Yes
Head demonstrator	Josh Lim					No	No

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