

MTRN2500

Computing for Mechatronic Engineers

Term 3, 2021



Course Overview

Staff Contact Details

Convenors

| Name | Email | Availability | Location | Phone |
|---------------|--------------------------------------------------------------|------------------------------------|-----------------------------------|--------------|
| Liao (Leo) Wu | liao.wu@unsw.edu.au | 9:00 am - 5:00 pm, Monday - Friday | Room 301C, Ainsworth Building J17 | 02 9385 6548 |

Lecturers

| Name | Email | Availability | Location | Phone |
|-------------|----------------------------------------------------------------|------------------------------------|-----------------------------------|--------------|
| Mark Whitty | m.whitty@unsw.edu.au | 9:00 am - 5:00 pm, Monday - Friday | Room 510G, Ainsworth Building J17 | 02 9385 4230 |

Demonstrators

| Name | Email | Availability | Location | Phone |
|-------------------------|----------------------------------------------------------------------------------------|--------------|----------|-------|
| Ming Xuan (Calvin) Chua | mingxuan.chua@unsw.edu.au | | | |
| Carlo Pane | c.pane@unsw.edu.au | | | |
| Dan Nguyen | d.h.nguyen@student.unsw.edu.au | | | |
| Dylan Sanusi-Goh | d.sanusi-goh@unsw.edu.au | | | |
| Haijun Zeng | haijun.zeng@unsw.edu.au | | | |
| Kyra Alday | k.alday@student.unsw.edu.au | | | |
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| Sarah Dinh | nhu.dinh@student.unsw.edu.au | | | |
| Tanvee Islam | tanvee.islam@student.unsw.edu.au | | | |
| Zane El-Kamand | z.el-kamand@student.unsw.edu.au | | | |

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](#)

Course Details

Units of Credit 6

Summary of the Course

This course will teach students C++ and MATLAB programming. The first half of the course focuses on the learning of C++ programming for Mechatronic Engineering. During the second half of the course, the students are introduced to MATLAB in the context of Mechatronic systems.

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 skills 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. As such, the contributions from this course to the Mechatronic Engineering degree program are absolutely essential.

Course Aims

1. Introduce the object oriented concepts in software development.
2. Develop object oriented skills using C++.
3. Developing object oriented programs to implement control systems.
4. Making the students familiar with general and fundamental concepts of Matrix algebra using MATLAB.
5. Programming skills for matrix manipulation and data visualization skills using MATLAB.
6. Applications in solving differential equations, partial differential equations and solution visualization.

Course Learning Outcomes

After successfully completing this course, you should be able to:

| Learning Outcome | EA Stage 1 Competencies |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 1. Be well versed with structured and modular programming using C/C++ and to have appreciated the use of software to communicate with external devices. | PE1.1, PE1.3, PE1.6 |
| 2. Be able to understand how to interface to an external device through a computer program to effect control action. | PE2.2 |
| 3. Be able to develop prototype user interfaces to assist in the development of controlled Mechatronic systems. | PE2.2, PE2.3 |
| 4. To have developed a fundamental knowledge of the MATLAB framework and to have developed a skill to choose and use MATLAB tools to solve problems in Mechatronic and in other contexts of Engineering. | PE1.2, PE1.6, PE2.2 |

Teaching Strategies

This course involves eight hours (four hours of lecture and four hours of demonstration) per week of contact. It is expected that students will put in, at least, an additional seven hours per week of their own time. This time should be spent in revising lecture material, developing programs in C++ and MATLAB on their own, completing the set demonstration problems, and revising and learning for tests.

The teaching strategies that will be used include:

- Presentation of the material in lectures.
- Demonstrations to help students to understand program development and develop software solutions.

Additional Course Information

Prerequisite: COMP1531

Assumed knowledge and skills:

- Have basic proficiency with the C programming language;
- Be familiar with basic concepts of C programming, including variables, conditionals, loops, functions, and libraries;
- Understand how to use basic data structures like arrays;
- Have learnt some techniques for building, debugging and testing code and programs.

Assessment

| Assessment task | Weight | Due Date | Course Learning Outcomes Assessed |
|------------------------|--------|----------------|-----------------------------------|
| 1. Individual Projects | 60% | Not Applicable | 1, 2, 3, 4 |
| 2. Tests | 40% | Not Applicable | 1, 4 |

Assessment 1: Individual Projects

Assessment length: N/A

Submission notes: Refer to the assignment specs and announcements

Deadline for absolute fail: 50 hours after the due date for projects and N/A for weekly exercises

Marks returned: Within 2 weeks after due date for projects and within 1 week after due date for weekly exercises

Two individual projects on problem-solving using C++ and MATLAB programming and seven weekly exercises.

1. The first individual project (33%) is on C++. It will be released on Monday Week 3 and due by 13:00 Monday Week 7;
2. The second individual project (20%) is on MATLAB. It will be released on Monday Week 8 and due by 23:59 Sunday Week 10;
3. Seven weekly exercises (7%) will be released on Wednesday Week 1-4, 7-9 and due by 13:00 Monday Week 2-5, 8-10.
4. Refer to the assignment specs and announcements for more details.

This is not a Turnitin assignment

Assessment criteria

Refer to the assignment specs and announcements

Assessment 2: Tests

Assessment length: Up to one hour for each test

Submission notes: via Moodle Quiz Activities

Deadline for absolute fail: N/A

Marks returned: Within 1 week after the test date

Two individual tests on concepts and problem-solving using C++ and MATLAB programming (multiple choice questions and coding questions).

- Test 1 (21%) is on C++ and scheduled between 18:00 and 19:30 on Friday Week 5.
- Test 2 (19%) is on MATLAB and scheduled between 18:00 and 19:30 on Friday Week 10.

This is not a Turnitin assignment

Assessment criteria

Refer to the announcements

Attendance Requirements

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

Course Schedule

[View class timetable](#)

Timetable

| Date | Type | Content |
|-------------------------------------|---------|-------------------------------------------------------------------------------|
| Week 1: 13 September - 17 September | Lecture | Introduction & C++ Basics |
| Week 2: 20 September - 24 September | Lecture | Classes, Pointers, References & Dynamic Allocation |
| Week 3: 27 September - 1 October | Lecture | Libraries, STL, Composition, Inheritance & Polymorphism |
| Week 4: 4 October - 8 October | Lecture | I/O Stream, File I/O, Enumerations, Operator overloading & Exception handling |
| Week 5: 11 October - 15 October | Lecture | Generic Programming & C++ Revision |
| Week 7: 25 October - 29 October | Lecture | Introduction to Matlab - Vectors and Matrices, Data Structures & Objects |
| Week 8: 1 November - 5 November | Lecture | Plotting, Scripts & Functions |
| Week 9: 8 November - 12 November | Lecture | ODE, Simulink & App Designer |
| Week 10: 15 November - 19 November | Lecture | Examples of MATLAB applications in Engineering problems & Matlab Revision |

Resources

Recommended Resources

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

- UNSW Library website: <https://www.library.unsw.edu.au/>
- Moodle: <https://moodle.telt.unsw.edu.au/login/index.php>

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.

In this course, recent improvements resulting from student feedback include:

- More time for lecture sessions
- More hands-on demonstrations

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Late policy

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day, for a minimum of zero marks.

The late penalty is applied per calendar day (or part thereof), including weekends and public holidays, that the assessment is overdue.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item. For example:

- Your course has an assessment task worth a total of **30 marks (Max Possible Mark)**
- You submit the assessment **2 days after the due date**
- The assessment is marked as usual and achieves a score of **20 marks (Awarded Mark)**
- The late policy is applied using **Late Mark = Awarded Mark - (Days*Penalty per Day)*Max Possible Mark**. Your adjusted final score is **8 marks** ($20 - ((2*0.2)*30)$).

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

1. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
2. Online quizzes where answers are released to students on completion, or
3. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
4. Pass/Fail assessment tasks.

Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations, these are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates. For further information on

exams, please see the [Exams](#) webpage.

Special Consideration

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 submitting an assessment or sitting an exam.

UNSW now has a [Fit to Sit / Submit rule](#), which means that if you attempt an exam or submit a piece of assessment, 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](#).

Please note that students will **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID-19 illness or isolation** will be required.

Special Consideration Outcomes

Assessments have default Special Consideration outcomes. The default outcome for the assessment will be advised when you apply for Special Consideration. Below is the list of possible outcomes:

| Outcome | Explanation | Example |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time extension | Student provided more time to submit the assessment | e.g. 1 more week of time granted to submit a report |
| Supplementary assessment | Student provided an alternate assessment at a later date/time | e.g. a supplementary exam is scheduled during the supplementary exam period of the term |
| Substitute item | The mark for the missed assessment is substituted with the mark of another assessment | e.g. mark for Quiz 1 applied also applied as mark for Quiz 2, meaning if a student achieved a mark of 20/30 for Quiz 1 and was granted Special Consideration for Quiz 2, a mark of 20/30 would be applied for Quiz 2, etc |
| Exemption | All course marks are recalculated excluding this assessment and its weighting | e.g. The course has an assessment structure of: - Assignments 30%, - Lab report 30%, - Final Exam 40%. If the Lab report is missed and student is granted Special Consideration, then the assessment structure may be reweighted as follows: - Assignments 50% - Final Exam 50% as though the Lab report did not exist |
| Non-standard | Course Coordinator is contacted for the outcome when special consideration is granted as the outcome differs on a case-by-case basis | e.g. typical for group assessments where time extension supplementary assessment could be granted to the group member, time extension could be granted to the whole group, etc. Clarify with your Course Convenor for |

Academic Honesty and Plagiarism

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.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

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) even suspension from the university. The Student Misconduct Procedures are available here:

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

Academic Information

Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

On-campus class attendance

****T3-2021 UPDATE****

Classes will be entirely ONLINE until at least Week 6, after which we will receive further advice from UNSW about the return of face-to-face classes. Students who are enrolled in face-to-face classes will have access to the course's online content but NO classes will be changed to reflect online delivery until Week 6 due to uncertainty regarding delivery mode for the rest of the term. Please go to your course's Moodle modules and MS Teams sites for further information about accessing course resources and content.

Public distancing conditions must be followed for all face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. No over-enrolment is allowed in face-to-face classes. Students enrolled in online classes can swap their enrolment from online to a **limited** number of on-campus classes by Sunday, Week 1. Please refer to your course's Microsoft Teams and Moodle sites for more information about class attendance for in-person and online class sections/activities.

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by [NSW health](#) or government authorities. Current alerts and a list of hotspots can be found [here](#). **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed. Further information is available on any course Moodle or Teams site.

In certain classroom and laboratory situations where physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to the
FAQs: <https://www.covid-19.unsw.edu.au/safe-return-campus-faqs>

Guidelines

All students are expected to read and be familiar with UNSW guidelines and policies. In particular,

students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)

Image Credit

Photo by Stephen Blake March 2017, Willis Annexe (J18) Thermofluids lab

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

| Program Intended Learning Outcomes | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| Knowledge and skill base | |
| PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline | ✓ |
| PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline | ✓ |
| PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline | ✓ |
| PE1.4 Discernment of knowledge development and research directions within the engineering discipline | |
| PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline | |
| PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline | ✓ |
| Engineering application ability | |
| PE2.1 Application of established engineering methods to complex engineering problem solving | |
| PE2.2 Fluent application of engineering techniques, tools and resources | ✓ |
| PE2.3 Application of systematic engineering synthesis and design processes | ✓ |
| PE2.4 Application of systematic approaches to the conduct and management of engineering projects | |
| Professional and personal attributes | |
| PE3.1 Ethical conduct and professional accountability | |
| PE3.2 Effective oral and written communication in professional and lay domains | |
| PE3.3 Creative, innovative and pro-active demeanour | |
| PE3.4 Professional use and management of information | |
| PE3.5 Orderly management of self, and professional conduct | |
| PE3.6 Effective team membership and team leadership | |