UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Semester 2 2018

MTRN2500

COMPUTING FOR MECHATRONIC ENGINEERS

1. Staff contact details

Contact details and consultation times for course convenor

Name: Mark Whitty
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Moodle: https://moodle.telt.unsw.edu.au/course/view.php?id=35699

Consultation concerning this course should in the first instance be made with your demonstrators, then using the Moodle discussion forums.

Contact details and consultation times for additional lecturers/demonstrators/lab staff

Please see the course Moodle.

2. Important links

- Moodle
- UNSW Mechanical and Manufacturing Engineering
- Course Outlines
- Student intranet
- UNSW Mechanical and Manufacturing Engineering Facebook
- UNSW Handbook

3. Course details

Credit Points

This is a 6 unit-of-credit (UoC) course and involves 5 hours per week (h/w) of face-to-face contact.

The UNSW website states “The normal workload expectations of a student are approximately 25 hours per semester for each UoC, including class contact hours, other learning activities, preparation and time spent on all assessable work. Thus, for a full-time enrolled student, the normal workload, averaged across the 16 weeks of teaching, study and examination periods, is about 37.5 hours per week.”

This means that you should aim to spend about 9 h/w on this course. The additional time should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

Contact hours

	Day	Time	Location
Lectures	Wednesday	1pm – 3pm	Webster Theatre B (G17-290)
	Thursday	1pm – 2pm	Webster Theatre B (G17-290)
(Web)	Any	Any	Moodle
Lab	Monday	9am – 11am	Willis Annexe 212 (J17-212)
	Monday	11am – 1pm	Willis Annexe 212 (J17-212)
	Monday	1pm – 3pm	Willis Annexe 212 (J17-212)
	Tuesday	12pm – 2pm	Willis Annexe 212 (J17-212)
	Tuesday	2pm – 4pm	Willis Annexe 212 (J17-212)
	Tuesday	4pm – 6pm	Willis Annexe 212 (J17-212)
	Wednesday	9am – 11am	Willis Annexe 212 (J17-212)
	Wednesday	11am – 1pm	Willis Annexe 212 (J17-212)
	Thursday	9am – 11am	Willis Annexe 212 (J17-212)
	Thursday	11am – 1pm	Willis Annexe 212 (J17-212)

Please refer to your class timetable for the learning activities you are enrolled in and attend only those classes. Lectures run from week 1 to week 12. Labs run from week 2 to week 13.

Summary and Aims of the course

This course focuses on the learning of C++ programming and object-oriented programming for Mechatronic systems. 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 and vital.

Student learning outcomes

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

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 appreciate the use of software to communicate with external devices.	1.1, 1.3, 1.6
2.	Understand how to interface to an external device through a computer program to effect control action.	2.2
3.	Be able to develop prototype user interfaces to assist in the development of controlled Mechatronic systems.	2.2, 2.3
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 engineering.	1.2, 1.6, 2.2

4. Teaching strategies

Teaching of this course is through lectures and laboratory sessions which include various forms of assessment.

The provision of the learning environment in the laboratory is to facilitate you to develop confidence in managing laboratory tasks as projects. Demonstrators in the laboratories are there to provide you guidance and assistance in managing the laboratory tasks.

5. Course schedule

Week	Topic	Lecture Location	Lab activity in J18-212
1 22/07/2018	Introduction to Object Oriented Programming, Object Classes, Member data and functions	Webster B	-
2 29/07/2018	Version control, Encapsulation	Webster B	Lab induction, Set up Visual Studio, C++ revision
3 05/08/2018	Formation of classes and their interfaces, Inheritance	Webster B	Tutorial on classes
4 12/08/2018	Polymorphism, abstract classes, class hierarchies,	Webster B	Version control
5 19/08/2018	Virtual functions, function overloading, dynamic casting	Webster B	Quiz 1 and marking project 1
6 26/08/2018	Container classes, Operator overloading	Webster B	OpenGL 1 - setup assignment
7 02/09/2018	Data structures	Webster B	OpenGL 2 - draw 2D shapes, dynamic casting
8 09/09/2018	Introduction to Matlab, multidimensional data	Webster B	Project 2
9 16/09/2018	Matlab structures and classes	Webster B	Quiz 2 and marking project 2
Mid-semester break			
10 30/09/2018	Image acquisition and processing	Webster B	Matrices vs for loops
11 07/10/2018	Plotting, networking	Webster B	Set and get handles for plotting
12 14/10/2018	MEX files and interfacing with C	Webster B	Project 3
13 21/10/2018	No lecture		Quiz 3 and marking project 3
Exam period	Final exam	TBA	

6. Assessment

Assessment overview

Assessment	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Individual Projects	-	30%	1, 2, and 4	Accuracy and quality of solution	Weeks 5 and 13	N/A	Two weeks after submission
Group Project	-	20%	1 and 3	Accuracy and quality of solution	Week 9	N/A	Two weeks after submission
Quiz	Short answer	15%	1, 2, 3 and 4	Accuracy and quality of solution	During week 5, 9 and 13 lab classes	N/A	One week after assessment
Final exam	2 hours	35%	1 and 4	Accuracy and quality of solution	Exam period, date TBC	N/A	Upon release of final results

Full details of the assessment tasks will be available on Moodle, including submission and demonstration times. Note that deadlines above are a guide only as full details will be in each assignment description.

Assignments

Presentation

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.

Submission

Late submission of any assessment item is not permitted unless special consideration (see below) has been granted.

Marking

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.

Examinations

There will be one 2 hour examination at the conclusion of the course, covering all course content.

You must be available for all tests and examinations. Final examinations for each course are held during the University examination periods, which are June for Semester 1 and November for Semester 2.

Provisional Examination timetables are generally published on myUNSW in May for Semester 1 and September for Semester 2

For further information on exams, please see the Exams section on the intranet.

Calculators

You will need to provide your own calculator, of a make and model approved by UNSW, for the examinations. The list of approved calculators is shown at student.unsw.edu.au/exam-approved-calculators-and-computers

It is your responsibility to ensure that your calculator is of an approved make and model, and to obtain an "Approved" sticker for it from the School Office or the Engineering Student Centre prior to the examination. Calculators not bearing an "Approved" sticker will not be allowed into the examination room.

Special consideration and supplementary assessment

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

7. Expected resources for students

Recommended Textbooks

- J.Katupitiya & K. Bentley, "Interfacing with C++", Springer 2006
- P.H. Winston, "On to C", Addison Wesley
- P.H. Winston, "On to C++", Addison Wesley

Additional Readings

Some materials from earlier years may also be available on the course home page on Moodle.

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

Course discussion forums will be available as an educational resource.

8. 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

- full overhaul of the Moodle course home page and content
- improved organisation of assignments
- improved structure and content of lab sessions

9. 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: 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

Further information on School policy and procedures in the event of plagiarism is available on the intranet.

10. Administrative matters and links

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

- Attendance, Participation and Class Etiquette
- UNSW Email Address
- Computing Facilities
- Assessment Matters (including guidelines for assignments, exams and special consideration)
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Student Support Services

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex 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
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (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