UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Term 2 2019

MTRN3500
COMPUTING APPLICATIONS IN MECHATRONICS SYSTEMS

Contents

1. Staff contact details

Contact details and consultation times for course convenor

Name: Associate Professor Jay Katupitiya
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Moodle: https://moodle.telt.unsw.edu.au/login/index.php

Consultation: Please contact me through email to make an appointment. Preferred consultation modes are first through email and if necessary face-to-face.

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

The additional demonstrators and their contact details will be posted on Moodle before the commencement of the course.

Please see the course Moodle.

2. Important links

- Moodle
- Lab Access
- Computing Facilities
- Student Resources
- Course Outlines
- Engineering Student Support Services Centre
- Makerspace
- UNSW Timetable
- UNSW Handbook
- UNSW Mechanical and Manufacturing Engineering

3. Course details

Credit points

This is a 6 unit-of-credit (UoC) course and involves 4 hours per week (h/w) of face-to-face contact.

The normal workload expectations of a student are approximately 25 hours per term for each UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

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	Monday	9 am – 11 am	Webster Theatre B (K-G15-290)
(Web stream)	Any	Any	Moodle
Demonstrations	Monday	2 pm – 4 pm	Willis Annexe 213
	Tuesday	1 pm – 3 pm	Willis Annexe 213
	Tuesday	3 pm – 5 pm	Willis Annexe 213
	Wednesday	9 am – 11 am	Willis Annexe 213
	Wednesday	1 pm – 3 pm	Willis Annexe 213
	Wednesday	3 pm – 5 pm	Willis Annexe 213
	Thursday	11 am 1 pm	Willis Annexe 213
	Thursday	1 pm – 3 pm	Willis Annexe 213
	Friday	11 am – 1 pm	Willis Annexe 213
	Friday	1 pm – 3 pm	Willis Annexe 213
	Friday	3 pm – 5 pm	Willis Annexe 213

Please refer to your class timetable for the learning activities you are enrolled in and attend only those classes.

Summary and Aims of the course

The aim of this course is to allow you to develop skills to write professional grade software you can use in your future careers. The previously acquired C/C++ programming and control systems knowledge is used to develop user interfaces, simulations models and control algorithms for the control of vehicles including car-like robotic vehicles, tracked vehicles such as bulldozers and four-wheel-steer and four-wheel-drive vehicles. Kinematic and/or dynamic models of these vehicles will be used in developing simulation models. In addition, the course will also teach the interfacing of data acquisition systems, motion control systems, sensors such as inertial sensors, GPS sensors, laser sensors and encoders to facilitate sensing and actuation. The course has an extensive experimental content where the above developed software will be used to control either a tracked vehicle or a wheeled vehicle.

Student learning outcomes

This course is designed to address the below learning outcomes 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 have appreciated the use of software to communicate with external devices.	PE1.1
2.	Be able to understand data structures, data transfer and transmission as well as inter-process communication.	PE1.1
3.	Be able to develop full software packages that are usable with commercial grade Mechatronic systems.	PE2.3

4. Teaching strategies

Teaching of this course is through web-based or face-to-face lectures and laboratory sessions. All laboratory work is individual work and attendance is preferred. The majority of the laboratory work involves some form of hardware. Initially, the hardware is predominantly sensors and various kinds of interface devices such as analogue and digital input/output devices. Towards the end of the course, actuators will be introduced.

The provision of the learning environment in the laboratory is to facilitate you to develop confidence in managing laboratory tasks as projects. The majority of the lab work involving actuators will be supervised by the demonstrators, professional officers and the academic in charge.

5. Course schedule

Week	Topic	Location	Suggested Readings
1	Introduction and Revision of C/C++	Webster Theatre B	Moodle content
2	Public Holiday		
3	General Interfacing – Hardware descriptions	Webster Theatre B	Moodle content
4	Programming Data Acquisition Systems	Webster Theatre B	Moodle content
5	Shared Memory and Inter-process Communication	Webster Theatre B	Moodle content
6	Process management	Webster Theatre B	Moodle content
7	Ethernet Communication – ASCII data sensors	Webster Theatre B	Moodle content
8	Serial/USB-Serial communication – Binary data sensors	Webster Theatre B	Moodle content
9	Implementing software on UAVs/ UGVs	Webster Theatre B	Moodle content
10	Selected vehicle models and their simulation	Webster Theatre B	Moodle content
11	Revision on Process management and software architecture	Webster Theatre B	Moodle content

6. Assessment

Assessment overview

Assessment	Group Project? (# Students per group)	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Programming assignment†	No	Completely operational software	20%	1 and 2	See assignment specification for exact marking criteria	In class assessment during your allocated lab session in Week 5.	After 5 calendar days from your allocated submission time	2 weeks after submission
Programming assignment‡	No	Completely operational software	20%	3	See assignment specification for exact marking criteria	In class assessment during your allocated lab session in Week 9.	After 5 calendar days from your allocated submission time	2 weeks after submission
Quiz (3)	No	2.5 hours	60%	1, 2 and 3	Lecture/Lab content from weeks 1-3, 4-6, 7-10 inclusive.	In weeks 4, 7 and 11, during lecture times.₸	N/A	Immediately after each quiz

† The assignment specification will be available from week 1 onwards in Moodle.

‡ The assignment specification will be available from week 5 onwards in Moodle.

₸ The tests will be held in Ainsworth Rooms 203 and 204 and will be fully supervised.

Assignments

Presentation

During assessment weeks, you will be working in the laboratory under supervised conditions on the solutions to your assignments. At the end of the assignment, you must submit your solution online to Moodle, and it will be auto marked by software meant for that purpose.

Submission

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 per cent (20%) 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.

Work submitted after the 'deadline for absolute fail' is not 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 are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

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

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

This course will not have an examination.

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 available 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 Engineering Student Supper Services Centre prior to the examination. Calculators not bearing an “Approved” sticker will not be allowed into the examination room.

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 submitting an assessment or sitting an exam.

Please note that UNSW now has a Fit to Sit / Submit rule, which means that if you sit 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.

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

The relevant chapters from the text book “Interfacing with C++” are available on Moodle Homepage of MTRN3500 together with a number of additional documents. Some materials from earlier years may also be available at Moodle’s MTRN3500 Home page.

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

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 progressive assessment in contrast to bulk assessment at the end of the term.

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, 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

10. 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
- Computing Facilities
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Lab Access

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