UNSW AUSTRALIA

Course Outline

Semester 2 2015

Never Stand Still | Engineering | Mechanical and Manufacturing Engineering

MTRN3500

COMPUTING APPLICATIONS IN MECHATRONIC SYSTEMS

Contents

1. Staff Contact Details

Contact details and consultation times for course convenor

Name: Associate Professor Jay Katupitiya
Office: ME311F
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Consultation Times: In session Tuesdays from 5-6 pm.

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

None.

2. Course details

Credit Points:

This is a 6 unit-of-credit (UoC) course, and involves four 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

Lectures	**Day**	**Time**	**Location**
	Tuesday	2 pm – 4 pm	Colombo Theatre B
Demonstrations	Monday	12 noon – 2 pm	MTRN213
	Monday	4 pm – 6 pm	MTRN213
	Tuesday	11 am – 1 pm	MTRN213
	Thursday	9 am – 11 am	MTRN213

Summary of the Course

This course focuses on the continued learning of C++ with an emphasis on the application of C++ to real world programming tasks.

Aims of the Course

Description: The course is designed to complement the knowledge and skills gained by students in MTRN2500 course so that they can develop application programs to deal with real world programming tasks. They will learn how interface directly to sensors and actuators that are commonly used in Mechatronic Systems. The will then learn to put together different software modules designed by then or other individuals to form comprehensive software that are of commercial grade.

The courses in the Mechatronics discipline are built up on 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 corner stone of the fundamental courses on which the Mechatronic Engineering course at UNSW is built upon. 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 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 Comprehensive, theory-based understanding of underpinning fundamentals
2.	Be able to understand data structures, data transfer and transmission as well as inter-process communication.	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
3.	Be able to develop full software packages that are usable with commercial grade Mechatronic systems.	PE2.3 Application of systematic engineering synthesis and design processes

3. Teaching strategies

Teaching of this course is through lectures and laboratory sessions. All laboratory work is individual work and attendance is preferred.

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 all the guidance and assistance is managing the laboratory tasks.

4. Course schedule

Topic	**Date Tuesday (2pm-4pm)**	**Location**	**Lecture Content**	**Demo/ Lab**	**Suggested Readings**
Revision of OOP	Week 1	Colombo B	Revision of Object Oriented Programming	None	Moodle lecture notes
General Interfacing	Week 2	Colombo B	Principles of input/output to hardware	None	Moodle lecture notes
Data acquisition systems	Week 3	Colombo B	Programming data acquisition systems	None	Moodle lecture notes
Serial Communication	Week 4	Colombo B	Programming serial communication	None	Moodle lecture notes
Ethernet Communication	Week 5	Colombo B	Client and server software	None	Moodle lecture notes
Binary and ASCII Data	Week 6	Colombo B	Dealing with binary and ASCII data	None	Moodle lecture notes
File Streams	Week 7	Colombo B	File I/O with binary and ASCII data	None	Moodle lecture notes
Reading Sensors	Week 8	Colombo B	Reading sensors such as GPS and IMUs	None	Moodle lecture notes
Controlling actuators	Week 9	Colombo B	Driving unmanned ground vehicles	None	Moodle lecture notes
Inter-process communication	Week 10	Colombo B	Inter process communication with shared memory	None	Moodle lecture notes
Multi-process management	Week 11	Colombo B	Process creation and management	None	Moodle lecture notes
Special topics & revision	Week 12	Colombo B	Special topics and revision	None	Moodle lecture notes

5. Assessment

Assessment task	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date, time, and submission requirements
Programming Assignment†	Completely operational software	20%	1 and 2	Refer to assignment specification for exact details.	Meeting with a demonstrator during week 7.
Programming Assignment‡	Completely operational software	20%	3	Refer to assignment specification for exact details.	Meeting with a demonstrator during week 10.
Final exam	2 hours	60%	1-3	All course content from weeks 1-12	Exam period, date TBC

† The assignment specification will be available from week 2 onwards in Moodle.
‡ The assignment specification will be available from week 6 onwards in Moodle.

Assignments

Presentation

All programs must be explained fully to your demonstrator. A significant portion of the marks are for your knowledge demonstration during your meeting with the demonstrator.

At the end of the demonstrations, you must submit all your software in a zipped file form to Moodle submission site before midnight of the Friday of the week the assignment is assessed.

Submission

Late submissions will be penalised 5 marks per calendar day (including weekends). An extension may only be granted in exceptional circumstances. Where an assessment task is worth less than 20% of the total course mark and you have a compelling reason for being unable to submit your work on time, you must seek approval for an extension from the course convener ***before the due date***. Special consideration for assessment tasks of 20% or greater must be processed through https://student.unsw.edu.au/special-consideration.

It is always worth submitting late assessment tasks when possible. Completion of the work, even late, may be taken into account in cases of special consideration.

Examinations

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 Administrative Matters.

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 https://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 Administrative Matters, available on the School website and on Moodle, and the information on UNSW's Special Consideration page.

6. 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.

Library:

http://info.library.unsw.edu.au/web/services/services.html

7. Course evaluation and development

Feedback on the course is gathered periodically using various means, including the Course and Teaching Evaluation and Improvement (CATEI) 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 practical applications of the developed software. Hence, this session the students will be able to use the software they develop to control unmanned ground vehicles.

8. 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: https://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: http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Further information on School policy and procedures in the event of plagiarism is presented in a School handout, Administrative Matters, available on the School website.

9. Administrative Matters

You are expected to have read and be familiar with *Administrative Matters*, available on the School website: www.engineering.unsw.edu.au/mechanical-engineering/sites/mech/files/u41/S2-2015-Administrative-Matters_20150721.pdf

This document contains important information on student responsibilities and support, including special consideration, assessment, health and safety, and student equity and diversity.

Jay Katupitiya
20 July 2015

Appendix A: Engineers Australia (EA) Professional Engineer Competency Standards

	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