MTRN2500

COMPUTING FOR MECHATRONIC ENGINEERS
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Appendix A: Engineers Australia (EA) Competencies
1. Staff contact details

Contact details and consultation times for course convenor

Name: Mark Whitty  
Office location: J17-510G  
Tel: (02) 9385 4230  
Email: m.whitty@unsw.edu.au  

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

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
</table>
| 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:

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>EA Stage 1 Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Be well versed with structured and modular programming using C/C++ and to</td>
<td>1.1, 1.3, 1.6</td>
</tr>
<tr>
<td>appreciate the use of software to communicate with external devices.</td>
<td></td>
</tr>
<tr>
<td>2. Understand how to interface to an external device through a computer program</td>
<td>2.2</td>
</tr>
<tr>
<td>to effect control action.</td>
<td></td>
</tr>
<tr>
<td>3. Be able to develop prototype user interfaces to assist in the development of</td>
<td>2.2, 2.3</td>
</tr>
<tr>
<td>controlled Mechatronic systems.</td>
<td></td>
</tr>
<tr>
<td>4. To have developed a fundamental knowledge of the Matlab framework and to</td>
<td>1.2, 1.6, 2.2</td>
</tr>
<tr>
<td>have developed a skill to choose and use Matlab tools to solve problems in</td>
<td></td>
</tr>
<tr>
<td>Mechatronic engineering.</td>
<td></td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Lecture Location</th>
<th>Lab activity in J18-212</th>
</tr>
</thead>
</table>
| 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

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

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/

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

<table>
<thead>
<tr>
<th>Program Intended Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PE1: Knowledge and Skill Base</strong></td>
</tr>
<tr>
<td>PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals</td>
</tr>
<tr>
<td>PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing</td>
</tr>
<tr>
<td>PE1.3 In-depth understanding of specialist bodies of knowledge</td>
</tr>
<tr>
<td>PE1.4 Discernment of knowledge development and research directions</td>
</tr>
<tr>
<td>PE1.5 Knowledge of engineering design practice</td>
</tr>
<tr>
<td>PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice</td>
</tr>
<tr>
<td><strong>PE2: Engineering Application Ability</strong></td>
</tr>
<tr>
<td>PE2.1 Application of established engineering methods to complex problem solving</td>
</tr>
<tr>
<td>PE2.2 Fluent application of engineering techniques, tools and resources</td>
</tr>
<tr>
<td>PE2.3 Application of systematic engineering synthesis and design processes</td>
</tr>
<tr>
<td>PE2.4 Application of systematic approaches to the conduct and management of engineering projects</td>
</tr>
<tr>
<td><strong>PE3: Professional and Personal Attributes</strong></td>
</tr>
<tr>
<td>PE3.1 Ethical conduct and professional accountability</td>
</tr>
<tr>
<td>PE3.2 Effective oral and written communication (professional and lay domains)</td>
</tr>
<tr>
<td>PE3.3 Creative, innovative and pro-active demeanour</td>
</tr>
<tr>
<td>PE3.4 Professional use and management of information</td>
</tr>
<tr>
<td>PE3.5 Orderly management of self, and professional conduct</td>
</tr>
<tr>
<td>PE3.6 Effective team membership and team leadership</td>
</tr>
</tbody>
</table>