**Instructor Information and Office Hours**

Dr. Lynn Marshall  lynnmar@sce.carleton.ca  ME4230

**Office Hours**: Mon 1:30-2:15pm; Tue 2:35-3:15pm; Wed 5:35-6:00pm; Thu 10:30-11:15am

**Email**: All email communications must specify "ECOR 1606" in the subject line.

**TA Information**

See CU Learn.

**Course Number and Calendar Description**

ECOR 1606 [0.5 credit]
Problem Solving and Computers
Introduction to engineering problem solving. Defining and modeling problems, designing algorithmic solutions, using procedural programming, selection and iteration constructs, functions, arrays, converting algorithms to a program, testing and debugging. Program style, documentation, reliability. Applications to engineering problems; may include numerical methods, sorting and searching.

**Prerequisites**

No prerequisites. Precludes additional credit for SYSC 1005, SYSC 1100 (no longer offered), SYSC 1102 (no longer offered), COMP 1005, COMP 1405.

**Course Objectives**

Introduction to problem solving using pseudo-code, flowcharts, C++ and C++, with applications to engineering.

**Learning Outcomes**

By the end of this course students should be able to

1) identify the data/inputs/assumptions, and the objectives of the problem from the description

2) evaluate arithmetic and logical expressions

3) execute a set of instructions (flowchart or pseudo-code, or C++) with assignments, selection, conditional and loop statements including functions and arrays.

4) implement C++ programs

5) modify and correct C++ programs
Graduate Attributes (GA’s)

The Canadian Engineering Accreditation Board requires graduates of engineering programs to possess 12 attributes. This course develops students' competence in GA1 (Knowledge Base), GA 2 (Problem Analysis), and GA 5 (Use of Engineering Tools). The specific graduate attributes measured and the mapping to learning outcomes is:

<table>
<thead>
<tr>
<th>Graduate Attribute</th>
<th>Learning Outcome(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4.S Programming and algorithms</td>
<td>4</td>
</tr>
<tr>
<td>2.1 Problem definition</td>
<td>1</td>
</tr>
<tr>
<td>2.2 Approach to the problem</td>
<td>1, 2</td>
</tr>
<tr>
<td>2.3 Use of assumptions</td>
<td>1</td>
</tr>
<tr>
<td>2.4 Interpreting the solution - validity of results</td>
<td>5</td>
</tr>
<tr>
<td>5.3 Tools for design, experimentation, simulation, visualization, and analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

The attributes will be assessed based on performance on the final lab test and final examination.

Textbooks and Other Resources

- This course uses cuLearn, Carleton’s learning management system. To access your courses on cuLearn, go to [carleton.ca/culearn](http://carleton.ca/culearn).
  - For help and support, go to [carleton.ca/culearnsupport/students](http://carleton.ca/culearnsupport/students). Any unresolved questions can be directed to Computing and Communication Services (CCS) by phone at 613-520-3700 or via email: ccs_service_desk@carleton.ca.
  - **Students are responsible for all information posted on CU Learn.** Information regarding the course will be updated regularly throughout the term. Students should check the web site at minimum in advance of every lecture and lab session.

- **Required Textbooks:**
  - *Problem Solving with Computers*, Bryant, Marshall, Wallace, Prometheus Press. Cost C$22. Instructions on where/when you can purchase a copy will be posted on the web site.
  - *Carleton University ECOR 1606 Spring 2019: Programming in C++* Online zyBook will be used for assignment problems through-out the term. A copy of this is mandatory for ALL students otherwise credit for the assignment portion of the course will not be possible and can be purchased from zyBooks for US$58 and is good until Aug 5th, 2019. You must have the Spring 2019 version! NO credit will be granted for previous term versions!
    - Sign in or create an account at [https://learn.zyBooks.com/](https://learn.zyBooks.com/)
    - You **MUST** use your @email.carleton.ca or @uottawa.ca Email address.
    - Enter zyBook code CARLETONECOR1606MarshallSpring2019
    - Click Subscribe
Further Reading:
- Texts: There are a large number of introductory C++ programming texts available. Some are better than others but in general any such text will serve the student who wants a "second opinion". One good possibility is *Engineering Problem Solving with C++* by Delores M. Etter and Jeanine A. Ingber (Pearson Prentice-Hall).
- Web resources: There are a large number of C and C++ programming resources on the web. Specific links will be provided as the term progresses but [http://www.cplusplus.com](http://www.cplusplus.com) is a very complete resource that we will use regularly in lectures.

**Evaluation and Grading Scheme**

Lab Exams: 45%  (Early Feedback Exam 5%, Lab Midterm 10%, Lab Final 30%)

Written Exams: 50%  (Midterm 10%, Final 40%)

Assignments: 5%  (zyBooks)

**Breakdown of course requirements (labs, assignments, quizzes, exams, etc)**

Examinations:

There will be three laboratory exams (an early feedback exam, a lab midterm, and a lab final) and two written tests (a midterm and a final). In the laboratory tests students will use computers. In the written tests students will answer questions on paper. The midterm will be held during class time on Thu May 23rd. The final will be held during the University’s examination period. The laboratory exams will take place on the dates indicated on the lab schedule. All exams will be closed book. Students will, however, be supplied with standard reference sheets.

The final examination is for evaluation purposes only and will not be returned to students. You will be able to make arrangements with the instructor or with the department office to see your marked final examination after the final grades have been made available.

Students who miss an exam will receive a mark of zero unless they have a legitimate reason for being absent and provide appropriate documentation dated within one day of the exam and presented to their instructor within three working days. In this case the weight of the missed exam will normally be transferred to the following exam of the same type (e.g. the weight of the early feedback lab test will be transferred to the lab midterm). The exception is that there will be a make-up written midterm and make-up lab final. Make-ups will be during one of the other lab sections if possible. A make-up will be scheduled (only if needed) on or after the last day of classes.

Unless they receive permission from the instructor ahead of time, students are required to write exams in their registered lecture or lab section.
There is to be complete silence during all exams. The only questions permitted concern typographical errors in the exam paper. All other questions – what is expected for the answer, or how to interpret a problem – are not permitted. If you are unsure about a question, you are to state an assumption that does not contradict the exam paper, and answer accordingly. (Please read: Item 10 of Examination Regulations, http://carleton.ca/ses/exams/examination-procedures/examination-regulations/)

Assignments:

Assignments will be posted on the web site as the course progresses based on the student activities within the zyBooks online text. All assignments will be completed on-line within the web text resource and must be completed by 11:55pm Tue Jun 18th. Please do not ask for exemptions and/or extensions as you have the entire term to complete these tasks. Grading is automated within the web resource and will be based on successful completion of the tasks.

Students MUST ensure that they clearly identify themselves (exactly same name as used by Carleton and use their @cmail.carleton.ca Email address) within the on-line text to ensure credit is received for assignments.

To achieve full credit for assignments, a student must complete 70% of the assigned tasks (i.e. 70% complete as reported by zyBooks) for each of the first 10 chapters of the textbook covered in the course. The percentage complete for a chapter is the average of the orange participation activities and the blue challenge activities for the non-optional exercises. Students that complete more than 70% will receive pro-rated bonus credit for this work (i.e. to a max of 7/5 if 100% of the first 8 chapters completed) only if at least 70% of the tasks within each of the 10 assigned chapters is completed. The textbook contains significant additional material (shown as optional) that is not covered in ECOR 1606. Students are welcome to complete this for extended learning but NO credit for this material will be awarded.

Midterm Bonus: Students that have completed at least 70% of the assigned tasks for each of zyBooks chapters 1 through 4 and 100% of chapters 9 and 10 before the written midterm (deadline 11:55pm Wed May 22nd) will receive a bonus of 1 for their assignment mark (not their midterm mark!). Allowing a potential 8/5 grade on assignments when combined with the term end mark. This Midterm Bonus is an all or nothing mark with no partial award so students receive either 1 or 0. No extensions will be granted.

Do not conclude that, because the assignments are “only” worth 5% of your final mark, they are not worth doing. Doing the assignments is the one of the best way of acquiring the skills that you need to pass this course.

For those who find the above complicated, here is pseudo-code that you can use to calculate your zyBook mark (out of 5, with a maximum of 8; i.e. up to 3 bonus marks):
let \( p_1, p_2, p_3, p_4, p_5, p_6, p_7, p_8, p_9, p_{10} \) be the % complete of the first 10 chapters at 11:55pm Tue Jun 18th

let \( pm_1, pm_2, pm_3, pm_4, pm_9, pm_{10} \) be the % complete of the first 4 and last 2 chapters at 11:55pm Wed May 22nd

if ( all of \( p_1, p_2, p_3, p_4, p_5, p_6, p_7, p_8, p_9, p_{10} \geq 70 \) ) then
  \[
  \text{mark} = 5 + \left( \left( \text{sum of } p_1 \text{ to } p_8 \right) - 560 \right) / 120
  \]
else
  \[
  \text{mark} = 0
  \]
  \[
  i = 1
  \]
  while ( \( i \leq 8 \) ) do
    \[
    \text{mark} = \text{mark} + \min \left( 1, \frac{p_i}{70.0} \right) * 0.625
    \]
    \[
    i = i + 1
    \]
  endwhile
endif

if ( all of \( pm_1, pm_2, pm_3, pm_4 \geq 70 \) and \( pm_9 \) and \( pm_{10} \) both == 100) then
  \[
  \text{mark} += 1
  \]
endif

**Problem Sets**

There will be additional OPTIONAL problem sets posted roughly every 2 weeks throughout the term. These provide students with additional opportunity to apply the course materials. Solutions will be provided at the same time as the subsequent problem set.

Programming and Problem Solving is a language-learning process and thought-process skill and this is best achieved through employing the skills and language in the same way that immersion is the best way to learn a second language. The problem sets provide an opportunity to solve problems and create programs.

**Labs**

There are two labs per week, starting on Thu May 9th. Check the dates below carefully. Normally, students will complete a practical programming exercise during their scheduled three-hour lab period. The programming exercises will focus on one particular aspect of programming. Programming and problem solving are both practical skills that are only learned through practice. The Tutorial labs provide the opportunity for students to develop their skills with the support of the TA team. For non-exam labs, students who miss their regular lab due to illness or another conflict may attend another lab (without permission of the instructor) to complete and submit their work.

Some lab periods will alternatively be used to conduct lab exams. Lab exams will be similar to regular lab exercises, but exam conditions will prevail, namely: each student will individually prepare and submit their own solution with no talking or electronic communication allowed.
Lab Schedule:

There are 11 labs. Labs #3, #7 and #10 are lab tests.

<table>
<thead>
<tr>
<th>Lab</th>
<th>Topic</th>
<th>Dates</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Tutorial (selection and iteration)</td>
<td>May 9</td>
</tr>
<tr>
<td>2</td>
<td>Tutorial (using C--)</td>
<td>May 14</td>
</tr>
<tr>
<td>3</td>
<td>Early Feedback Test</td>
<td>May 16</td>
</tr>
<tr>
<td>4</td>
<td>Tutorial (Dev C++ Debugger)</td>
<td>May 21</td>
</tr>
<tr>
<td>5</td>
<td>Tutorial (The Dev C++ Environment)</td>
<td>May 23</td>
</tr>
<tr>
<td>6</td>
<td>Tutorial (Lab Midterm Preparation)</td>
<td>May 28</td>
</tr>
<tr>
<td>7</td>
<td>Lab Midterm</td>
<td>May 30</td>
</tr>
<tr>
<td>8</td>
<td>Tutorial (Function Intro)</td>
<td>June 4</td>
</tr>
<tr>
<td>9</td>
<td>Tutorial (Functions)</td>
<td>June 6</td>
</tr>
<tr>
<td>10</td>
<td>Lab Final</td>
<td>June 11</td>
</tr>
<tr>
<td>11</td>
<td>Tutorial (Arrays)</td>
<td>June 13</td>
</tr>
</tbody>
</table>

Week-by-Week breakdown

This is intended only as a general guide to what will be covered and is subject to change.

<table>
<thead>
<tr>
<th>Week</th>
<th>Material</th>
<th>Text (Bryant et al.)</th>
<th>Text (zyBooks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to course, selection and iteration</td>
<td>Ch 1</td>
<td>Ch 1</td>
</tr>
<tr>
<td>1</td>
<td>Selection and iteration, Programming in C--</td>
<td>Ch 1; Ch 2</td>
<td>Ch 1 - 4</td>
</tr>
<tr>
<td>2</td>
<td>Programming in C--</td>
<td>Ch 2</td>
<td>Ch 1 - 4</td>
</tr>
<tr>
<td>2</td>
<td>Selection and iteration in computer programs</td>
<td>Ch 3</td>
<td>Ch 1 - 4</td>
</tr>
<tr>
<td>3</td>
<td>More examples, multi-way if, do while</td>
<td>Ch 3</td>
<td>Ch 3,4</td>
</tr>
<tr>
<td>3</td>
<td>Moving from C-- to C++, midterm exam</td>
<td>Ch 4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C to C++, breaks, for loops</td>
<td>Ch 4; Ch 5</td>
<td>Ch 4</td>
</tr>
<tr>
<td>4</td>
<td>Output formatting</td>
<td>Ch 5</td>
<td>Ch 5, 8.1-8.3</td>
</tr>
<tr>
<td>5</td>
<td>Functions</td>
<td>Ch 6</td>
<td>Ch 6</td>
</tr>
<tr>
<td>5</td>
<td>Functions, Arrays</td>
<td>Ch 6; Ch 7</td>
<td>Ch 6,7</td>
</tr>
<tr>
<td>6</td>
<td>More arrays</td>
<td>Ch 7</td>
<td>Ch 7</td>
</tr>
<tr>
<td>6</td>
<td>Input/output (input errors, reading from files)</td>
<td>Ch 8; Ch 9</td>
<td>Ch 8.4-8.5</td>
</tr>
</tbody>
</table>
General Regulations

**Attendance:** Students are expected to attend all lectures and lab periods. The University requires students to have a conflict-free timetable. For more information, see the current *Undergraduate Calendar, Academic Regulations of the University, Section 1.2, Course Selection and Registration and Section 1.5, Deregistration.*

**Health and Safety:** Every student should have a copy of our Health and Safety Manual. A PDF copy of this manual is available online: [http://sce.carleton.ca/courses/health-and-safety.pdf](http://sce.carleton.ca/courses/health-and-safety.pdf)

**Deferred Term Work:** Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor and in all cases this must occur no later than three (3.0) working days after the term work was due. The alternate arrangement must be made before the last day of classes in the term as published in the academic schedule. For more information, see the current *Undergraduate Calendar, Academic Regulations of the University, Section 2.6, Deferred Term Work.*

**Appeal of Grades:** The processes for dealing with questions or concerns regarding grades assigned during the term and final grades is described in the *Undergraduate Calendar, Academic Regulations of the University, Section 2.7, Informal Appeal of Grade and Section 2.8, Formal Appeal of Grade.*

**Academic Integrity:** Students should be aware of their obligations with regards to academic integrity. Please review the information about academic integrity at: [https://carleton.ca/registrar/academic-integrity/](https://carleton.ca/registrar/academic-integrity/). This site also contains a link to the complete Academic Integrity Policy that was approved by the University's Senate.

**Plagiarism:** Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offense that will not be tolerated.
Academic Accommodation: You may need special arrangements to meet your academic obligations during the term. You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://www.carleton.ca/equity/. For an accommodation request, the processes are as follows:

- **Pregnancy obligation**: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **Religious obligation**: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **Academic Accommodations for Students with Disabilities**: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult https://carleton.ca/pmc/students/dates-and-deadlines/ for the deadline to request accommodations for the formally-scheduled exam (if applicable).

- **Survivors of Sexual Violence**: As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton’s Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/sexual-violence-support/.

- **Accommodation for Student Activities**: Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

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