CMP112H: Computational Thinking I
Section A
Fall 2017
12:00 - 1:50 pm TR
TC 13

Instructor: John Symms
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Email: jsymms@carrollu.edu
Office Hours: 10:00-11:50 am TR, or by appointment
Text: A First Course in Computational Thinking - Symms, St. George, Feil and Johnson
Calculator: None needed
Prerequisite: MAT101 or equivalent

Course Overview
Computational Science is an interdisciplinary field that seeks to simulate real-world phenomena. Simulations involve using mathematical models and computer models to generate data, which is then analyzed to assess the models, to make predictions, or to estimate. Simulations can require enormous numbers of computations, so it is with recent advances in computational power and applied mathematics that Computational Science has become an integral part in doing modern science. For example, in computational pharmacology, simulations are run to test new drugs before using live specimens, providing for the development of more accurate drugs. As future practitioners, you may not be implementing simulations, but at minimum this course (and CMP114H) will enhance your computational skills, expand your understanding of ways mathematics and computer science are used in modern science, develop extensive data-analysis skills, and be fun.

Course Objectives
This course will introduce students to:

1. Some essential elements of computational science;
2. Basic statistical analysis concepts;
3. Essential computer literacy skills.

Learning Outcomes:
By the end of this course, students should be able to:

• Design, implement and analyze simulations that mimic real-world phenomena. (Obj 1-3)
• Make the connection between real-world processes and their corresponding mathematical models. (Obj 2)
• Analyze data (simulated and real) using linear regression models. (Obj 1-3)
• Create and interpret appropriate visualizations of (simulated and real) data sets. (Obj 1-3)
- Analyze (simulates and real) data sets using descriptive statistics and basic inferential statistics. (Obj 2)

- Communicate with a computer using both graphical and text interfaces. (Obj 1, 3)

Assessment will be conducted via in-class assignments, homework, projects, and exams.

**Attendance**

Students are expected to attend all classes. If you miss a class, you are responsible for any assignments or announcements made.

**Course Materials / Textbook**

In accessing the course materials, use Firefox or Safari.

**Exercises**

Exercises will be assigned each day, with some problems to be collected and graded. Some assignments will be completed or partially completed in class, while others will require some outside work. Unless otherwise noted, assignments will be due at the beginning of the next class period, i.e., problems assigned on Thursday will be due at before noon the following Tuesday (provided the campus isn’t closed on the following Tuesday). If you are a few minutes late to class, turn in homework when you arrive, not after class. Exercises that are too late (instructor’s discretion) won’t be accepted. Exams will be strongly influenced by all assigned problems, so it is to your advantage to learn how to do all assigned exercises. Collected problems will be given integer scores between 0 and 4: 4 = essentially flawless; 3 = minor errors, but no major errors; 2 = one major error; 1 = at least two major errors; 0 = no attempt.

**Exams**

Exams will measure both your conceptual understanding of the material and your problem solving skills. There will be two 1.5-hour exams and a comprehensive 2-hour final. I expect to give the 1-hour exams on October 12 and November 16. The final will be given at 11:00 am on Friday, December 15. If you miss an exam, acceptable written documentation for the absence must be supplied to be eligible for a make-up.

**Academic Honesty**

All work on assignments, quizzes and tests is expected to be your own and represent your ability in course content. The Carroll University Academic Integrity Policy is located in your student handbook. Please familiarize yourself with this policy. If a student violates this policy in any way, the instructor or College reserves the right to impose a sanction of failure on the assignments/assessment or failure in the course.

**Grades**

The grading scheme is as follows:
<table>
<thead>
<tr>
<th>Assignments</th>
<th>Points</th>
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<tbody>
<tr>
<td>Exercises</td>
<td>200</td>
</tr>
<tr>
<td>1.5-hour Exams</td>
<td>150 each</td>
</tr>
<tr>
<td>Final Exam</td>
<td>200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>700</strong></td>
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<table>
<thead>
<tr>
<th>Percent Interval</th>
<th>Grade</th>
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</thead>
<tbody>
<tr>
<td>[92, 100]</td>
<td>A</td>
</tr>
<tr>
<td>[88, 92)</td>
<td>AB</td>
</tr>
<tr>
<td>[82, 88)</td>
<td>B</td>
</tr>
<tr>
<td>[78, 82)</td>
<td>BC</td>
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<tr>
<td>[68, 78)</td>
<td>C</td>
</tr>
<tr>
<td>[58, 68)</td>
<td>D</td>
</tr>
<tr>
<td>[0, 58)</td>
<td>F</td>
</tr>
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**Final day to drop:** Thursday, November 2.

**Carroll Portal (LMS)**
This course will use the Carroll Portal for various purposes, including for your grades. Keep track of your grades, and notify the instructor should you spot an error.

**Final Notes**
1. Special accommodations for this course may be granted via direct orders from the Walter Young Center (WYC). It is your responsibility to notify the WYC of your special needs. (They will require certain forms of verifiable documentation or diagnoses.) Such accommodations will be made only after the instructor has received notification from the WYC, and will not be given retroactively for previous assignments or exams.

2. The instructor and the College reserve the right to modify, amend, or change the syllabus (course requirements, grading policy, etc.) as the curriculum and/or program require(s).
Tentative Schedule

- Chapters 1 & 2 - Illustrating Computational Science using Low-Tech Objects, Models & Data Summaries (0.5 weeks)
- Chapter 3 - Using Microsoft Excel to Summarize Data (2 weeks)
- Chapter 4 - Simulations in Excel (1 week)
- Chapter 5 - Algorithmic Thinking using Python (1.5 weeks)
- Chapter 6 - Behavior of Sample Means and Sample Proportions (0.5 week)
- Chapter 7 - Population Models (1 week)
- Chapter 8 - Confidence Intervals for a Population Parameter (1.5 weeks)
- Chapter 9 - Introduction to Hypothesis Testing (1 week)
- Chapter 10 - Testing a Single Population Mean (1.5 weeks)
- Chapter 11 - Testing a Single Population Proportion (0.5 week)
- Chapter 12 and/or 13 - Testing Two Population Parameters (1 week)
- Chapter 14 - Correlation & Regression (1 week)