Computation Thinking I

CMP 112L - Fall 2017 (4 Credits)

Instructor: Tom St. George, Ph.D
E-mail: tstgeorg@carrollu.edu
Phone: 262-524-7142

Class: MWF 10:40-11:50AM in NH TC11
Office: Math House 100
Office Hours: MW 9:30am–10:30am & 1pm–2pm,
Tues 1:15pm–2:45pm,
Fri 9:30am–10:30am
or by appointment

Prerequisites: College Algebra (MAT 101) or placement recommendation

Textbooks:

- A First Course in Computational Thinking by Symms, St. George, Feil, and Johnson

Recommended Guides and References:

- OpenIntro Statistics by Diez, Barr and Cetinkaya-Rundel, 3rd edition.
- How to Think Like a Computer Scientist: Learning with Python by Downey, Elkner, and Meyers http://faculty.carrollu.edu/djohnson/Python

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 CMP114) 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 intends to introduce students to

1. Some essential elements of computational thinking;
2. Basic statistical analysis concepts;
3. Essential computer literacy skills.
**Learning Outcomes:** Upon successful completion of this course the student will be able to demonstrate:

- 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)

**Course Format:**

**Quizzes:** Weekly quizzes will be given to reinforce the material learned. These will be conducted online through Canvas. Failure to notify the instructor in a timely manner of conflicting engagements that result in a missed quiz will result in a zero for the quiz.

**In-class Labs and Homework:** Labs will be conducted in-class and will be counted as participation. It is expected that you attend every class. Unexcused absences will result in zeros for participation. If you plan to be absent, please let me know. Note that you will be accountable for all material covered and announcements made in the class with no exceptions.

Homework will be assigned weekly as an aid to learning the material. Failure to submit in-class labs/homework in a timely manner will result in forfeiture of credit for that assignment.

**Exams:** There will be a total of two exams in this class: 1 Midterm Exam and 1 Final Exam. The tentative date of the midterm exam is October 13. The final exam for this class, which is comprehensive, is on **Monday, December 18 at 11 am**. I do not have the power to move this exam. Do not book any travel arrangements during this time!

Make-ups for the midterm exam will only be allowed under EXTREME circumstances. Please notify me well in advance of such situations.
Grading Criteria:

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<tr>
<td>In-class Labs</td>
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<td>Quiz</td>
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<td>Homework</td>
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<td>Midterm</td>
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<td>Final Exam (Cumulative)</td>
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<td><strong>Total</strong></td>
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Grading Scale:

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Additional Resources:

**Learning Commons:**
Beyond my office hours, extra math help can be found (free) in the Learning Commons housed in the lower level of the library.

**Academic Integrity:** All work on assignments, quizzes, and tests is expected to be your own and represent your ability in course content. Due to the nature of the course, giving account access to another student or students in the class or sending copied homework, labs, or exams to other students in the class is deemed a violation of academic integrity and will be reported.

The Carroll University Academic Integrity Policy is located in the student handbook. Please familiarize yourself with it. Carroll University emphasizes that students have an obligation to conduct their academic work with honesty and integrity. All acts of academic misconduct are serious and will be reported. If you have any questions about appropriate citations, please ask.

**Accommodation for Disabilities:**
Students with disabilities who may need accommodations or any student considering obtaining documents should make an appointment with the Walter Young Center (262-524-7621) no later than the first week of class.

**Carroll Canvas (LMS):** This class will use the Canvas for various purposes. Your grades will be posted there when available. Please keep track of your grades yourself as well, and if you notice any errors, please let me know as soon as possible.

The instructor and the University 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)