



COURSE OUTLINE		
TERM: Fall 2020	COURSE NO: COMP 215	
INSTRUCTOR:	COURSE TITLE: Introduction to Computational Science	
OFFICE: LOCAL: E-MAIL: @capilanou.ca	SECTION NO(S):	CREDITS: 4.0
OFFICE HOURS:		
COURSE WEBSITE:		

Capilano University acknowledges with respect the Lil'wat, Musqueam, Squamish, Sechelt, and Tsleil-Waututh people on whose territories our campuses are located.

COURSE FORMAT

1.5 hours of class time, 3 hours lab time, plus an additional 1.5 hours delivered through on-line or other activities for a 15-week semester, which includes two weeks for final exams.

COURSE PREREQUISITES

COMP 115 (C+); and MATH 116 (C-) or MATH 108 (C-)

CALENDAR DESCRIPTION

Computational Science is considered by many the “third pillar” of scientific enquiry, alongside theory and physical experimentation. It combines computer simulation, scientific visualization, mathematical modeling, computer programming, data structures and algorithms to offer insights into a wide range of problems. Students are introduced to the principles, concepts, approaches, technologies, and practices of computational science. Students learn practical simulation and computational experimentation skills. The course focuses on the application of these techniques in a wide range of domains, including economics, biology, and the physical and social sciences; and includes an introduction to complexity science, systems thinking, and dynamic systems.

COURSE NOTE

COMP 215 is an approved Science and Technology course for Cap Core requirements.

COMP 215 is an approved Science course.

COMP 215 is an approved Quantitative/Analytical course for baccalaureate degrees.

REQUIRED TEXTS AND/OR RESOURCES

Downey, A. Think Complexity 2e. Green Tea Press, 2018.

(<http://greenteapress.com/wp/think-complexity-2e/>)

Shiflet, A. and G. Shiflet. Introduction to Computational Science: Modeling and Simulation for the Sciences (2nd ed). Princeton University Press, 2014.

COURSE STUDENT LEARNING OUTCOMES

On successful completion of this course, students will be able to do the following:

- identify the foundational concepts, tools, and techniques used in computational science;
- configure and apply some common technologies used for computational science;
- analyze basic dynamic systems from a wide range of disciplines and
 - i. design a suitable data model to represent the system state;
 - ii. select a suitable technique for its simulation
(e.g., difference equation, Monte Carlo, or cellular automata);
- develop and implement a simulation model in a programming language;
- interpret ways in which computation is being applied to problems throughout science and business, and contribute meaningfully to discussions about its efficacy and ethicality;
- apply computational techniques to solve problems and gain a deeper understanding of concepts and ideas learned in other courses;
- apply computational techniques within their own field of study.

Students who complete this Science and Technology course will be able to do the following:

- Apply numerical and computational strategies to solve problems;
- Assess the cultural, economic, and political effects of technology;
- Evaluate scientific information (e.g., distinguish primary and secondary sources, assess credibility and validity of information).
- Demonstrate how a problem, concept, or process can be modelled numerically, graphically, or algorithmically;
- Participate in scientific inquiry and communicate the elements of the process, including making careful and systematic observations, developing and testing a hypothesis, analyzing evidence, and interpreting results.

COURSE CONTENT

# of Weeks (Approx.)	Topics
1	Introduction to computational science and complexity:
1	Introduction to Object-Oriented programming
2	Simulation and computational experimentation Difference equations, feedback, equilibrium
2	Statistical simulation: Monte Carlo and re-sampling
2	Graphs and scale-free networks
2	Cellular automata and spatial simulation
1	Self-organized criticality
1	Agent-based models
1	Review and Testing
(2)	Final Exam Period (Weeks 14 – 15)

EVALUATION PROFILE

Assignments + Quizzes	25%
Projects	30%
Term Test	15%
Final Exam (comprehensive)	25%
Performance Evaluation	5%
TOTAL	100%

GRADING PROFILE

A+ = 90-100	B+ = 77-79	C+ = 67-69	D = 50-59
A = 85-89	B = 73-76	C = 63-66	F = 0-49
A- = 80-84	B- = 70-72	C- = 60-62	

Grading System explanation

- Projects are completed in small groups and are peer-reviewed. Students receive a grade for both their project work and for their evaluation of their peer's work.
- The default **performance evaluation** component in the evaluation profile is pro-rated to the grade earned on the remainder of the profile. In exceptional circumstances, a student's improved performance in the later part of the term may justify an elevated grade. The instructor has sole discretion, in such cases, to alter the performance evaluation to elevate the student's grade to better reflect their performance at the end of term.

Incomplete Grades

Grades of Incomplete "I" are assigned only in exceptional circumstances when a student requests extra time to complete their coursework. Such agreements are made only at the request of the student, who is responsible to determine from the instructor the outstanding requirements of the course.

Late Assignments

Assignments are due at the beginning of the class on the due date listed. Late assignments are penalized 10% if submitted late on the due date, then 20% for each successive day until a solution is posted, and will not be accepted thereafter.

If you anticipate handing in an assignment late, please consult with your instructor beforehand.

Missed Exams/Quizzes/Labs etc.

A score of zero is normally given for missed work. Make-up exams or quizzes may be permitted, at the discretion of the instructor, and generally only in cases of medical emergency or severe personal crisis. In some cases, it may not be possible to accommodate a missed exam or quiz. Please consult with your instructor, ideally *before* the missed activity.

Attendance

Students are expected to attend and fully participate in all classes, labs, and associated activities. Students are responsible for all information given during lectures, labs, and tutorials, including exam dates and assignment deadlines, even if they were unable to attend for any reason.

English Usage

Students are expected to proofread all written work for any grammatical, spelling and stylistic errors. Instructors may deduct marks for incorrect grammar and spelling in written assignments.

Electronic Devices

Students may use electronic devices during class solely for class-related activities, such as note-taking, coding, and "just in time" research to contribute to class discussions.

On-line Communication

Outside of the classroom, instructors will (if necessary) communicate with students using either their official Capilano University email or Moodle; please check both regularly. Official communication between Capilano University and students is delivered to students' Capilano University email addresses only.

UNIVERSITY OPERATIONAL DETAILS**Tools for Success**

Many services are available to support student success for Capilano University students. A central navigation point for all services can be found at: <https://www.capilanou.ca/student-life/>

Capilano University Security: download the [CapU Mobile Safety App](#)

Policy Statement (S2009-06)

Capilano University has policies on Academic Appeals (including appeal of final grade), Student Conduct, Academic Integrity, Academic Probation and other educational issues. These and other policies are available on the University website.

Academic Integrity (S2017-05)

Any instance of academic dishonesty or breach of the standards of academic integrity is serious and students will be held accountable for their actions, whether acting alone or in a group. See policy and procedures S2017-05 Academic Integrity for more information: <https://www.capilanou.ca/about-capu/governance/policies/>

Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances, are prohibited and will be handled in accordance with the Student Academic Integrity Procedures.

Academic dishonesty is any act that breaches one or more of the principles of academic integrity. Acts of academic dishonesty may include but are not limited to the following types:

Cheating: Using or providing unauthorized aids, assistance or materials while preparing or completing assessments, or when completing practical work (in clinical, practicum, or lab settings), including but not limited to the following:

- Copying or attempting to copy the work of another during an assessment;
- Communicating work to another student during an examination;
- Using unauthorized aids, notes, or electronic devices or means during an examination;

- Unauthorized possession of an assessment or answer key; and/or,
- Submitting of a substantially similar assessment by two or more students, except in the case where such submission is specifically authorized by the instructor.

Fraud: Creation or use of falsified documents.

Misuse or misrepresentation of sources: Presenting source material in such a way as to distort its original purpose or implication(s); misattributing words, ideas, etc. to someone other than the original source; misrepresenting or manipulating research findings or data; and/or suppressing aspects of findings or data in order to present conclusions in a light other than the research, taken as a whole, would support.

Plagiarism: Presenting or submitting, as one's own work, the research, words, ideas, artistic imagery, arguments, calculations, illustrations, or diagrams of another person or persons without explicit or accurate citation or credit.

Self-Plagiarism: Submitting one's own work for credit in more than one course without the permission of the instructors, or re-submitting work, in whole or in part, for which credit has already been granted without permission of the instructors.

Prohibited Conduct: The following are examples of other conduct specifically prohibited:

- Taking unauthorized possession of the work of another student (for example, intercepting and removing such work from a photocopier or printer, or collecting the graded work of another student from a stack of papers);
- Falsifying one's own and/or other students' attendance in a course;
- Impersonating or allowing the impersonation of an individual;
- Modifying a graded assessment then submitting it for re-grading; or,
- Assisting or attempting to assist another person to commit any breach of academic integrity.

Sexual Violence and Misconduct

All Members of the University Community have the right to work, teach and study in an environment that is free from all forms of sexual violence and misconduct. Policy B401 defines sexual assault as follows:

Sexual assault is any form of sexual contact that occurs without ongoing and freely given consent, including the threat of sexual contact without consent. Sexual assault can be committed by a stranger, someone known to the survivor or an intimate partner.

Safety and security at the University are a priority and any form of sexual violence and misconduct will not be tolerated or condoned. The University expects all Students and Members of the University Community to abide by all laws and University policies, including B.401 Sexual Violence and Misconduct Policy and B.401.1 Sexual Violence and Misconduct Procedure (found on Policy page <https://www.capilanou.ca/about-capu/governance/policies/>)

Emergencies: Students are expected to familiarise themselves with the emergency policies where appropriate and the emergency procedures posted on the wall of the classroom.

DEPARTMENT OR PROGRAM OPERATIONAL DETAILS

Computer Access

Students may bring and use their own computing devices, running any modern OS (i.e., Windows, OSX, or Linux). Every effort is made to ensure that required course software can be freely downloaded and installed on student computer. However, it is the responsibility of each student to ensure their computer meets the minimum requirements of required course software, and to perform the installation and configuration of such software themselves.

Computer labs at the University will have course-required software installed and configured – students may use lab computers to complete all their course work.

Drop-in access to the University computers is available during the hours posted outside each lab, subject to availability. Please respect an instructor's directions if asked to leave the lab due to a class booking.

University policies on student conduct and use of University computer systems, available on the University website, will be strictly enforced.