The VIU community acknowledges the Snuneymuxw, Quw'utsun, Tla'amin, Snaw-naw-as and Qualicum First Nation on whose traditional lands we teach, learn, research, live and share knowledge.

Course Outline
CSCI 320

Foundations of Computer Science (3 credits)

CSCI 320 S26N01 and N02

January 6, 2026 – April 14, 2026

Calendar Description

A survey of formal models and results that form the theoretical foundation of computer science. Typical topics include finite automata, Turing machines, simple undecidable problems, context-free languages, grammars and elementary computational complexity. (3:1:0)

Course Description

From "Introduction to the theory of computation" by Michael Sipser:

"Finally, theory is good for you because it expands your mind. Computer technology changes quickly. Specific technical knowledge, though useful today, becomes outdated in a few years. Consider instead the abilities to think, to express yourself clearly and precisely, to solve problems, and to know when you haven't solved a problem. These abilities have lasting value. Studying theory trains you in these areas."

This course explores the essence of computation by investigating such questions as: What does it mean to compute something? Are some functions "harder to compute" than others – and what exactly does that mean? Are there functions that are not computable at all? Through answering these questions, we devise mathematical models of computation that lend themselves to applications and connections with search expressions, language models, compilers, and ultimately deepen our understanding of what we do when we do computer science.

THE ATTENDANCE POLICY:
Attendance in the lecture **will not be taken** beyond the second week of class. If there are waitlists, attendance will be taken in the first week and no-shows will be deregistered unless there is prior agreement of the instructor by email.

Students are responsible for receipt of announcements made in person in class. Students are responsible for material covered in class.

Delivery Mode

Face-to-face.

Contact hours

3 hours lecture & 1 hour seminar/week

Prerequisites and Corequisites

Math 123, and min. "C" in CSCI 260.

Proposed Schedule

Lecture:	Tue, Thu, 1:00-2:30
Seminars:	Tue, 9:00-10:00 (S26N01), 10:00-11:00 (S26N02)

Instructor Info

Instructor name:	Gara Pruesse
Instructor VIU email address:	Gara.Pruesse@viu.ca
Office Hours:	Thu 3:00-4:00
Office:	315-218

Learning Outcomes

By the end of this course students will have a working knowledge of:

- Regular languages
  - Finite State Automata; Non-determinism; conversion from NFA to DFA
  - Regular Expressions; Kleene's theorem; algorithms converting among REs, NFAs, DFAs
  - Pumping Lemma for Regular Languages; Closure theorems for Regular Languages
- Context free languages
  - Grammars
  - Push Down Automata, Deterministic and Non-deterministic
  - Regular Language containment
- Set Cardinality

- Turing machines
  - formal definition
  - variations: Non-deterministic; multitape
- Church-Turing thesis
  - Universal Turing Machine (not covered in text)
  - Decidable and Turing Recognizable Languages
  - Undecidability and the Halting Problem; Reduciblity
- Time complexity
  - NP and NP-completeness

Course Learning Materials

Textbook:

The following open-access, free online texts will be the texts for the course:

Theory of Computation by Anil Maheshwari and Michiel Smid (U. of Ottawa)

Models of Computation by John E. Savage (Brown University)

Various other texts may be useful to help the student understand the material, including the following book by Goddard, which has the virtue of being easy to understand and is a recommended read for those who find the material very challenging (though our treatment of Push-Down Automata differs from Goddard's):

Goddard, Wayne. **Introducing the Theory of Computation** ISBN 978-0-7637-412-9 ISBN10 0-7637-4125-6

And the classic text for the course is the following, useful to the student as the original version of the instructor's notes are from offerings that used this as the required text, and its influence on the presentation of material obtains:

Introduction to the Theory of Computation, any edition
by Michael Sipser. Thomson Course Technology. ISBN 978-0-534-95097

Evaluation and Assessment

- **Assignments**
  There will be approximately 5 short assignments; their total worth is 10 percent of your final grade. The assignments will typically be a number of assigned homework problems to be handed in, of which one or two will be marked.
  Paper assignments will be accepted in person. Students may also hand in assignments in electronic form if they are **not** scans of handwritten work.
  Scans of handwritten assignments will not be graded, but will be permitted as proof of completion by the deadline as long as the physical original is handed in on or before the first workday after the assignment is due.
  Each assignment will have a specified due date, and any assignments handed in after the due date, within 24 hours, will have 10% penalty. After 24 hours, the assignment grade will be zero. The lowest assignment grade will be dropped from the calculated assignment mark.
- **Midterms and Quizzes**
  There will be two midterms and several quizzes weighted as follows; dates To Be Determined.
  Midterm 1: 20 Midterm 2: 20 Quizzes total: 15 Total: 55
- **Final Exam**
  In addition, there will be a final exam worth 35 per percent. **A student must pass the final exam to pass the course.**
- **Policy on Re-Grading**
  Any assignment, quiz, or examination grade may be appealed. The instructor reserves the right to re-grade the entire piece of work submitted on appeal, not necessarily just the component that the student believes is in error.
  Note that a request for clarification does not, in itself, constitute an appeal. In fact, students are encouraged seek such clarification when they do not understand why they have been assigned a particular grade - this often results in a learning opportunity for both the student and the instructor.

Grades will be distributed as follows:

A+ >= 90.0	A >= 85.0	A- >= 80.0

B+ >= 76.0	B >= 72.0	B- >= 68.0
C+ >= 64.0	C >= 60.0	C->= 55.0
D >= 50.0		F otherwise

Course not completed due to unofficial withdrawal: UW
An incomplete Grade form is required to support an "I" grade.

Resources

- Department of Computer Science
- VIULearn will not be used for this course; instead, visit Gara's webpage for CSCI 320
- Library
- Academic Advising
- Writing Centre
- Math Learning Centre
- Services for Aboriginal Students
- Counseling Services
- Accessibility
- Registration
- VIU Students' Union

Accessibility

Vancouver Island University recognizes its legal duty to provide educational opportunities that enable students with a documented disability to access courses, programs, facilities, and services.

The Policy and Procedural Guidelines apply to all students who have identified themselves to the institution as having a documented disability who are inquiring about, applying to, or registered in credit or non-credit courses in both on and off-campus programs.

- Policy 32.02 - Services Available to Students with a Documented Disability

Academic Integrity

Integrity in academic work is a central element of learning and is the basis of intellectual pursuits in any academic community. It is also your responsibility to abide by the Student Conduct Code and Student Academic Code of Conduct.

- Academic Integrity

About Academic Integrity

- DO talk to your classmates about problems, even Assignment problems
- DO work in groups at a whiteboard
- DO read published solutions to similar problems to get ideas
- DO feel free to help your classmates to understand, if asked
- DON'T have any materials produced by or contribute to by anyone else within eyesight when you construct *your* solution to submit. You *can* view textbooks and legitimate web materials while constructing your answer to assignment questions. Legitimate web materials do NOT include the products of any solution-generating process, such as online homework services or generative AI – any process that takes a homework/assignment question and constructs a bespoke answer to that question is forbidden for assignment questions. Furthermore, submitting any assignment or homework question to an AI process is a violation of the instructor's or the text author's intellectual property rights.
- The use of so-called AI systems like ChatGPT is not only forbidden for assignment submissions, it is not recommended: such systems seem much better at generating plausible, but incorrect, answers than actual solutions, shifting your task from generating to recognizing a correct solution. Even if you manage to make such a determination successfully, without going through the thinking process yourself, you are likely to have considerable difficulty on the exams where you are on your own. Also, the instructor reserves the right to query students on their assignment submissions to assess their understanding of the solutions given.

Links University Policies, Standards, and Guidelines

- University Policies
- Freedom of Information and Protection of Privacy
- Student Conduct and Care (SCC)
- Student Academic Code of Conduct
- Student Affairs
- Academic Regulations
- Equity, Diversity, and Inclusion (EDI)