

# Course Intro

COMPSCI 3331

Fall 2022

# Overview

- ▶ Course Format
- ▶ Course Evaluation.
- ▶ What is this course about?

# Course Website

- ▶ Everything for the course is on `owl.uwo.ca`
- ▶ Course ID: COMPSCI 3331A 001 FW22
- ▶ What's on the website?
  - ▶ Videos
  - ▶ Course notes.
  - ▶ Forum
  - ▶ Syllabus
  - ▶ All Assignment Submission (gradescope)

- ▶ Mike Domaratzki - `mdomarat@uwo.ca`
- ▶ Office Hours (MC 355 E) - Monday 2:30-3:30 and Thursday, 2:30-4:30.
- ▶ I may have to change office hours on short notice - I will let you know on **owl** when this happens.
- ▶ Directions to MC 355 E are on the website.

# Course Times

- ▶ Tuesday - 3:30-5:30 - SSC 2050
- ▶ Wednesday - 2:30-3:30 - MC 110

# Textbook

- ▶ No required textbook for the course.
- ▶ Potential textbooks for those who would like one:
  - ▶ Rich, Automata, Computability and Complexity. (free PDF available [here](#).)
  - ▶ Sipser, Introduction to the Theory of Computation.
  - ▶ Martin, Introduction to Languages and the Theory of Computation.
  - ▶ Hopcroft, Motwani and Ullman, Introduction to Automata Theory, Languages and Computation.
- ▶ Differences in notation may exist between different textbooks and what we use in class.

# Course Evaluation

- ▶ Assignments (4) – 32 %
- ▶ In-class Quizzes (6) – 12 %
- ▶ Midterm (in class, Oct 25) – 20 %
- ▶ Final – 35 %

→ 10% free

# Assignments

- ▶ All assignments are submitted on Gradescope.
- ▶ All assignments equally weighted.
- ▶ Assignments are individual.
- ▶ No programming in this course.



# Assignment Due Dates

- ▶ Assignment 1 – October 11
- ▶ Assignment 2 – October 26
- ▶ Assignment 3 – November 22
- ▶ Assignment 4 – December 7

# Assignment Deadlines

- ▶ Late penalty for assignments - 1 % of the assignment value per hour, up to 48 hours.
- ▶ No assignments accepted after 48 hours.
- ▶ If you have a serious medical or compassionate reason, talk to your Academic Counsellor.
- ▶ Beyond the above, students can get **ONE** extension for an assignment. The extension is for 3 days (72 hours), no questions asked. See more details in the course outline.

# Quizzes

- ▶ Quizzes are held in class on Wednesday, for the first 15 minutes of class.
- ▶ Quizzes are open book.
- ▶ 8 quizzes, top 6 will be used to calculate your grade (2 % per quiz).
- ▶ If you miss a quiz for a documented reason, marks will be transferred to other quizzes.
- ▶ There are no make-up quizzes.

# Quiz Schedule

- ▶ Q1 - Sept 28
- ▶ Q2 - Oct 5
- ▶ Q3 - Oct 12
- ▶ Q4 - Oct 19
- ▶ Q5 - Nov 9
- ▶ Q6 - Nov 16
- ▶ Q7 - Nov 23
- ▶ Q8 - Nov 30

# Midterm and Final



- ▶ Closed book
- ▶ Midterm Exam is Oct ~~26~~ in class.
- ▶ No make-up midterm - marks will be transferred to final for documented reasons.
- ▶ Final exam will be scheduled by the registrar during the exam period.

# Midterm Format

- ▶ Midterm will be a **two-stage exam**
- ▶ Contains both an individual and a group portion.
  - ▶ You write the individual portion, then hand it in.
  - ▶ You get into groups of 3-4 (assigned before exam).
  - ▶ You solve a subset of very similar problems with your group and hand in **one copy**.
- ▶ More details will come, but **you don't need to know anyone in the course**.
- ▶ Vast majority of marks will be for individual portion (TBA, but  $\geq 85\%$  of midterm grade)
- ▶ Your mark will **never go down** because of the group portion.

# Course Format

- ▶ Pre-class videos:
  - ▶ posted on owl,
  - ▶ should be reviewed before class and the quiz.
- ▶ In-class: examples, proofs and more!
- ▶ Wednesday quizzes.
- ▶ Mentimeter - for questions

# Why is the class structured like this?

- ▶ Improved learning and retention.
- ▶ I know it may not be what you are used to.
- ▶ Philosophies:
  - ▶ Frequent Evaluation: You should know how you are doing in the class.
  - ▶ Separation of background and in-class material: Class time is to see course concepts in action, more detailed examples.
  - ▶ Two-stage exam helps ~~retention~~ - discussion of exam material.

retention



# Mentimeter

- ▶ Go to [menti.com](https://menti.com).
- ▶ Use the code 4660 1263.
- ▶ Questions are not marked - they are for you only.
- ▶ All questions are anonymous.

# Scholastic Offenses

- ▶ Scholastic offenses are taken seriously in Computer Science.
- ▶ Do not share your solutions to any evaluation with anyone, including posting in a public location.

# What is this course about?

- ▶ “Languages as sets of strings over an alphabet; operations on languages; finite automata, regular expressions; language hierarchy; Turing machines; models of computation.”
- ▶ This course looks at the underlying theory behind computation.
- ▶ By looking at restricted models, we focus on the fundamentals.
- ▶ Tools in this course are found in foundational ways in many areas of CS.
- ▶ Can ask questions like “What does it mean to be computable?” and “Are there problems that are not computable?”

# Major concepts in the course

- ▶ Finite automata and regular expressions
- ▶ Grammars: context-free grammars and parsing.
- ▶ Turing Machines: abstract models of computation.

# Canola Plants through Grammar Systems



Image from M. Cieslak *et al.*, L-system models for image-based phenomics: case studies of maize and canola, in *silico* Plants, Volume 4, Issue 1, 2022. (Creative Commons license)

# ANTLR

- ▶ ANTLR defines grammars for programming languages.
- ▶ Allows us to efficiently and automatically build compilers for these languages.
- ▶ Relies on the concepts of regular and context-free languages that we will learn in the course.

# Prokaryotic Gene Prediction

- ▶ Genomes are the collection of DNA in an organism. Not all the DNA is a gene.
- ▶ Given a genome (large sequence of nucleotides), where are the genes?
- ▶ Complex problem, even for simple organisms, like prokaryotes, like bacteria.
- ▶ Use HMMs (a type of automata) to predict where genes occur.

# How hard are problems?

- ▶ Turing Machines are the basis for examining how hard problems are.
- ▶ Can show that there are some problems that cannot be solved by any algorithm.
- ▶ Implications for tasks like program verification.