UNIVERSITY of GUELPH

COLLEGE of ENGINEERING AND PHYSICAL SCIENCES

SCHOOL OF COMPUTER SCIENCE

CIS*2910 Discrete Structures in Computing (II) W21 (3-2) [0.50]

Course Outline

Website:
See *CourseLink*.

LEC Times:
TUE, THU, 2:30pm to 3:50pm (*Zoom* meetings through *CourseLink*)
First meeting Jan 12, 2021, last meeting Apr 8, no meetings Feb 15-19

LAB Times:
1 - THU, 11:30am to 1:20pm (*Zoom* meetings through *CourseLink*)
2 - MON, 3:30pm to 5:20pm (*Zoom* meetings through *CourseLink*)
3 - TUE, 12:30pm to 2:20pm (*Zoom* meetings through *CourseLink*)
4 - MON, 7:00pm to 8:50pm (*Zoom* meetings through *CourseLink*)
5 - WED, 11:30am to 1:20pm (*Zoom* meetings through *CourseLink*)
6 - FRI, 9:30am to 11:20am (*Zoom* meetings through *CourseLink*)
First meeting Jan 11, 2021, last meeting Apr 12, no meetings Feb 15-19

Office Hours:
Office hours will be by appointment only, or posted on *CourseLink*.

Instructor:
Pascal Matsakis

Teaching Assistants:
Amirhossein Etaati, Aysu Gundogan, Mustafa Al-Obaidi, Tony Trinh

Contact:
1 - cis2910@socs.uoguelph.ca for issues related to course material, assignments, participation and challenge activities, etc.
2 - pmatsaki@uoguelph.ca for regrade requests, personal issues or issues surrounding the TAs, etc. (the subject of your message should then start with the number 2910).

Description

This course is a further introduction to discrete structures and formal methodologies used in computer science, including sequences, summations, recursion, combinatorics, discrete probability, and graph theory.

Format

A flipped classroom approach will be followed. You will rely heavily on the *zyBook* (see below): each week, you will be asked to read some of its sections and complete the related participation and challenge activities. *LEC Times* will be mainly dedicated to questions and answers regarding the course material, and simple examples and exercises. *LAB Times* will be mainly dedicated to more complex examples and exercises. You are also encouraged to use the *Discussions* tool in *CourseLink*.

Prerequisites

CIS*1300, (CIS*1910 or ENGG*1500)

Required Text

zyBook, CIS*2910: Discrete Structures in Computing II

1. Sign in or create an account at https://learn.zybooks.com
2. Enter *zyBook* code: UOGUELPHCIS2910MatsakisSpring2021
3. Subscribe

A subscription is $58. Subscriptions will last until May 11, 2021.

Additional Resources

- Rosen, Discrete Mathematics and Its Applications, Mc Graw Hill
- Stein, Drysdale and Bogart, Discrete Mathematics for Computer Scientists, Addison Wesley
- Gossett, Discrete Mathematics with Proof, Wiley

Topics

Sequences
- sequences, monotonic / arithmetic / geometric sequences
- summation notation, properties, double summation

Recursion
- explicitly / recursively defined sequences / sets
- from recursive to explicit and vice versa

Counting
- product / sum rules, inclusion-exclusion principle, pigeonhole principle
- permutations, lexicographic order relation
- combinations
- binomial coefficients / theorem, Vandermonde's / Pascal's / etc. identities
- combinatorial proofs

Discrete Probability
- probability mass function, probability measure
- conditional probability, independent / mutually exclusive events, Bayes' theorem
- integer random variables, expectation, law of large numbers

Graphs and Trees
- undirected / directed graphs
- paths / cycles, Euler / Hamilton paths, Eulerian / Hamiltonian graphs
- connected / complete / planar / bipartite graphs, chromatic number, four colour theorem
- trees (defined as particular graphs) and forests
- subgraphs, spanning trees / forests

Learning Outcomes

On successful completion of this course, you should be able to:

Recursion
- describe the concept of recursion and give examples of its use;
- solve a variety of basic recurrence equations;
- analyze a problem to create relevant recurrence equations
  or identify important counting questions;

Counting
- discuss applications of combinatorics in computer science;
- compute permutations and combinations,
  and interpret the meaning in the context of the particular application;

Discrete Probability
- discuss applications of probability theory in computer science;
- calculate probabilities of events and expectations of random variables
  for elementary problems such as games of chance;
- differentiate between dependent and independent events;
- apply the binomial theorem to independent events
  and Bayes' theorem to dependent events;

Graphs and Trees
- illustrate the basic terminology of graph theory;
- relate graphs and trees to counting;
- model computer science problems using graphs and trees.

Evaluation

Grading Components

Participation and challenge activities (20%)
Each week, you will be asked to read some sections of the *zyBook* and complete the related participation and challenge activities. Only in exceptional circumstances will excuses for missed deadlines or requests for extensions be entertained. Any such excuse or request must be presented to the instructor as soon as possible. The only remedy available for missed set of activities is redistribution of its weight to other components (at the discretion of the instructor).

Assignments (30%)
Note that the assignments are not programming assignments. Each assignment must be submitted in the form of a single *pdf* file via the *Dropbox* tool in *CourseLink*. The ordering of questions must be preserved. It is your responsibility to ensure that your answers are easily legible; an answer that is not easily legible may receive a mark of zero. Only in exceptional circumstances will excuses for missed deadlines or requests for extensions be entertained. Any such excuse or request must be presented to the instructor as soon as possible. The only remedy available for missed assignment is redistribution of its weight to other components (at the discretion of the instructor).

Final Exam (50%)
This is a test on all material covered in the *zyBook*, during the *LAB Times* meetings, and in complementary documents, if any, as specified in the *Zybook* or on *CourseLink*. It will be composed of multiple choice and/or short answer questions.

Regrade Requests

If you feel you deserved a better grade on an assignment, you may submit a regrade request. The request must be e-mailed to the instructor (pmatsaki@uoguelph.ca) and received within seven calendar days of the grade being posted. You are therefore encouraged to review the solutions as soon as possible, and to make sure your assignment has been correctly graded and your grade correctly recorded. The request must be submitted with the complete original graded assignment and should briefly summarize why you feel the original grade was unfair. Note that a regrade request may result in the entire assignment being regraded, and the revised grade may be higher or lower than the original grade.

Deadlines

First assignment (10%):	February 12, 2021
First set of participation activities (5%):	March 5, 2021
First set of challenge activities (5%):	March 5, 2021
Second assignment (10%):	March 19, 2021
Third assignment (10%):	April 9, 2021
Second set of participation activities (5%):	April 16, 2021
Second set of challenge activities (5%):	April 16, 2021

All deadlines are at 11:59pm. Deadline extensions are at the discretion of the instructor. The final exam (50%) will take place on April 21, 2021, from 11:30am to 1:30pm. Please note that all times mentioned in this course outline are local time for Guelph, Ontario.

Recording and Sharing of Materials

Presentations which are made in relation to course work (including *LEC Times* meetings, *LAB Times* meetings and *Office Hours* meetings, whether in-person or online) shall not be audio-recorded, video-recorded, copied or shared in any way without the permission of the instructor and the presenter (whether the instructor, a teaching assistant, a classmate or guest lecturer).

The *LEC* and *LAB Times* meetings might be recorded by the instructor, or by a teaching assistant at the instructor's request, and the recordings made accessible via *CourseLink*. These recordings are for the convenience of the students taking CIS*2910 in the winter of 2021—for their convenience only, and for that period of time only. The recordings, the links to the recordings, and any excerpts from the recordings (whether audio, image or video excerpts) shall not be copied or shared in any way.

Solutions to the assignments and to the exercises covered during the *LAB Times* meetings might be posted by the instructor on *CourseLink*. These solutions are posted for the convenience of the students taking CIS*2910 in the winter of 2021, and for their convenience only. The solutions, like any other course material, shall not be uploaded to any sites on the Internet (e.g., *Chegg* or *CourseHero*) and shall not be shared in any way.

Standard Statements

E-Mail Communication

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students. Use your <uoguelph.ca> account (not any other account) to contact the instructor or teaching assistants.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet a course requirement because of illness or compassionate reasons, please advise the instructor in writing. See the undergraduate degree regulations: https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Drop Date

Courses that are one semester long must be dropped by the end of the last day of classes. The regulations and procedures for dropping courses are available in the Undergraduate Calendar: https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Copies of Out-of-Class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student. When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway. Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability. Use of the SAS Exam Centre requires students to make a booking at least 7 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time. Please see: http://www.uoguelph.ca/sas

Academic Misconduct

You are expected to work on each problem on your own and present your own solution. The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor. Please review the Academic Misconduct Policy detailed in the Undergraduate Calendar: https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Tutoring

Tutoring At Guelph (https://tutoring.uoguelph.ca/) is a website available to all students. The website is essentially an electronic bulletin board in which students who wish to be a tutor can post their profiles and students wishing to find a tutor can search those profiles. It is a free service. You may also want to check the Supported Learning Groups (SLG) Program.

Resources

The Academic Calendars (https://www.uoguelph.ca/registrar/calendars/) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.