UNIVERSITY of GUELPH

COLLEGE of ENGINEERING AND PHYSICAL SCIENCES

SCHOOL OF COMPUTER SCIENCE

CIS*2910 Discrete Structures in Computing (II)
W23 (3-2) [0.50]
Course Outline

Website:
See *CourseLink*.

Lectures:
MON, WED, FRI, 4:30pm to 5:20pm, ROZH 101
First lecture Jan 9, last one Apr 10, no lectures Feb 20, 22, 24 and Apr 7

Labs:
1 - TUE, 3:30pm to 5:20pm, MACN 118
2 - FRI, 9:30am to 11:20am, MACN 118
3 - THU, 2:30pm to 4:20pm, MACN 118
4 - FRI, 11:30am to 1:20pm, MACN 118
5 - WED, 11:30am to 1:20pm, ALEX 028
6 - THU, 8:30am to 10:20am, MCKN 234
7 - THU, 12:30pm to 2:20pm, ALEX 028
8 - TUE, 1:30pm to 3:20pm, ALEX 028
First lab Jan 17, last one Apr 10, no labs Feb 20-24 and Apr 7

Regular Office Hours:
TUE, 9:30am to 11:20am, REYN 0004
THU 10:30am to 12:20pm, REYN 0004
First OH Jan 17, last one Apr 6, no OHs Feb 21, 23

Instructor:
Pascal Matsakis

Teaching Assistants:
Hatim Abedi Dalal, Dogu Gerger, Vedant Kanabar,
Myron Ladyjenko, Danindu Marasinghe, Marzieh Soltani Koupaei

Contact:
1 – cis2910@socs.uoguelph.ca (Myron Ladyjenko, lead teaching assistant) for questions regarding the course material, i.e., lectures, labs, assignments, midterm and *zyBook*.
2 – vkanabar@uoguelph.ca (Vedant Kanabar, lead marker) for regrade requests and other questions regarding your grades.
3 – pmatsaki@uoguelph.ca (Pascal Matsakis, instructor) for all other issues, e.g., course delivery, evaluation method, conflict with a teaching assistant, personal issues, administrative issues.

Description

Synopsis

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.

Prerequisites

(CIS*1300 or ENGG*1410), (CIS*1910 or ENGG*1500)

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 will 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.

Required Text

zyBook, CIS*2910: Discrete Structures in Computing II

1. Sign in or create an account at learn.zybooks.com
2. Enter *zyBook* code: UOGUELPHCIS2910MatsakisWinter2023
3. Subscribe

A subscription is $58. Subscriptions will last until May 05, 2023.

Note that some topics may not be discussed in class but covered in the *zyBook* instead. Also, some topics covered in the *zyBook* should be ignored. All these topics will be clearly indicated in the *zyBook* via instructor notes.

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

Evaluation

Grading Components

Participation and challenge activities (3% BONUS)
Before the start of every Monday's lecture, you will be expected to have read some sections of the *zyBook* and completed the related participation and challenge activities. This reading assignment, which will help you understand the lectures, will be indicated at the bottom of the last slide covered in the previous lecture. Excuses for missed activities and requests for extensions will not be entertained.

Assignments (30%)
There will be 3 assignments. They will all have the same weight. Each submission must be in the form of a single *pdf* file uploaded 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 course 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).

Midterm Examination (30%)
This is a closed-book test on all material covered in the *zyBook* and in the lecture and lab classes. Only in exceptional circumstances will excuses for missed test be entertained. Any such excuse must be presented to the course instructor as soon as possible, with all supporting documentation. The remedies available for missed test are redistribution of its weight to other components, or make-up test (at the discretion of the instructor).

Final Examination (40%)
This is a closed-book test on all material covered in the *zyBook* and in the lecture and lab classes. 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 or on the midterm exam, you may submit a regrade request. The request must be e-mailed to the lead marker and received within seven calendar days of the grade being posted on *CourseLink*. You are therefore encouraged to review the solutions as soon as possible, and to make sure your work has been correctly graded and your grade correctly recorded. The request must be submitted with a clear and sound explanation of why you feel the original grade was unfair. Note that a regrade request may result in your entire work being regraded, and the revised grade may be higher or lower than the original grade.

Deadlines

Participation and challenge activities
The relevant activities must be completed at least one hour before the start of every Monday's lecture.

Assignments

Assignment 1:	Sun Jan 29, 11:59pm
Assignment 2:	Sun Mar 19, 11:59pm
Assignment 3:	Sun Apr 02, 11:59pm

Examinations

Midterm examination (Part A):	Wed Mar 1, in class, 4:30pm to 5:20pm, ROZH 101
Midterm examination (Part B):	Fri Mar 3, online, 50 minutes between 4:30pm and 11:59pm
Final examination:	Fri Apr 21, online, 8:30am-10:30am

Other

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 lead teaching assistant, lead marker or instructor. Start the subject of your message with the number 2910.

Electronic Devices

Turn off and store away all electronic devices (e.g., laptops, tablets, calculators, mobile phones, cameras, video recorders, audio recorders) before you walk into the classroom. The only exceptions are devices used with a stylus for note-taking. Note-taking must then be the only use of the device. Photos, videos and audio recordings are not permitted during lectures and labs.

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://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-misconduct/

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

Drop Date

The last day to drop CIS*2910 is Apr 10, 2023. The regulations and procedures for dropping courses are available here: https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/dropping-courses/

Tutoring

If you would like to hire a tutor, please check:
https://www.uoguelph.ca/uaic/acadsupport-tutoring/

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.