UNIVERSITY of GUELPH

COLLEGE of ENGINEERING AND PHYSICAL SCIENCES

SCHOOL OF COMPUTER SCIENCE

# CIS*1910 Discrete Structures in Computing (I) W19 (3-2) [0.50]

## Course Outline

*Website:*
http://www.socs.uoguelph.ca/~matsakis/CIS1910

*Lectures:*
1 - TUE, THU, 11:30am to 12:50pm, MCLN 102
2 - TUE, THU, 2:30pm to 3:50pm, ALEX 100
First lecture Jan 8, last lecture Apr 4, no lectures Feb 18-22
Instructor Pascal Matsakis

*Labs:*
1 - MON, 7:00pm to 8:50pm, MINS 017
2 - WED, 3:30pm to 5:20pm, MINS 017
3 - WED, 12:30pm to 2:20pm, MCKN 233
4 - WED, 9:30am to 11:20am, MCKN 238
5 - FRI, 12:30pm to 2:20pm, MINS 017
6 - MON, 3:30pm to 5:20pm, MINS 017
7 - MON, 11:30am to 1:20pm, MINS 017
8 - TUE, 9:30am to 11:20am, MINS 017
First lab Jan 14, last lab Apr 5, no labs Feb 18-22
Instructors Gagandeep Kaur (1, 2, 6, 7) and Braden Gibson (3, 4, 5, 8)

*Office Hours:*
MON, 1:30pm to 2:30pm, REYN 3324
TUE, 9:00am to 10:00am, REYN 3324
THU, 8:30am to 9:30am, REYN 0003
FRI, 10:30am to 11:30am, REYN 0003
First OH Jan 14, last OH Apr 5, no OHs Feb 18-22

*Contact:*
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Pascal Matsakis (pmatsaki@uoguelph.ca)

# Description

### Synopsis

This course is an introduction to discrete structures and formal methodologies used in computer science, including Boolean algebra, propositional logic, predicate logic, proof techniques, set theory, equivalence relations, order relations, and functions.

### Topics

Unary / binary operations on a set, Boolean algebra / expressions, fundamental laws, duality principle; Propositional logic, propositions, logical operations / equivalences, truth tables, conjunctive / disjunctive normal form; Predicate logic, predicates, quantifiers, combining / negating predicates, nested quantifiers; Rules of inference, direct / existence / uniqueness proofs, proofs by contraposition / contradiction / cases / induction; Set builder notation, cardinality, power sets, set operations, Venn diagrams, Cartesian product, tuples; Binary relation over two sets / on a set, inverse / composite of binary relations; Equivalence relations / classes, partitions; Partial / total order relations, Hasse diagrams, maximal / minimal elements, greatest / least elements, upper / lower bounds, supremum / infimum; Partial / total functions, image / preimage of a set under a function, injections, surjections, bijections, inverse / composite of functions, sum / product of real functions, monotonicity of real functions of a real variable; Numeral systems, base b expansion, base conversion

### Learning Outcomes

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

- use Boolean algebra laws to derive other laws
  and to manipulate and complement Boolean expressions;
- relate Boolean algebra to logic and sets;
- apply formal methods of symbolic propositional and predicate logic,
  and informal but rigorous logical reasoning;
- give examples of the appropriate use of fundamental proof methods,
  including weak vs. strong induction;
- perform basic operations associated with sets, functions and relations;
- perform basic arithmetic operations in and conversions between
  binary, octal, hexadecimal, and decimal number systems;
- explain the use and importance of all the concepts and tools above
  in computer science and in modelling real-life situations.

### Required Textbook

zyBook, CIS*1910: Discrete Structures in Computing I

1. Sign in or create an account at https://learn.zybooks.com
2. Enter zyBook code: UOGUELPHCIS1910MatsakisWinter2019
3. Subscribe

A subscription is $58. You may begin subscribing on Dec 23, 2018.
Subscriptions will last until May 05, 2019.

Note that some topics will be discussed in both the zyBook and lecture classes, while others will be discussed only in the zyBook, or only in lecture classes. Topics discussed only in the zyBook include: strings (in Section 1.2), sequences (Section 1.4), linear combination of two numbers (Section 1.5), disjunctive and conjunctive normal forms (Section 2.3), Boolean satisfiability (Section 2.5), gates and circuits (Section 2.6), proofs by exhaustion (Section 4.4), anti-reflexivity (Section 6.2), floor and ceiling functions (Section 7.1). These topics are clearly indicated in the corresponding sections by instructor notes.

Some topics discussed in the zyBook should be ignored. These topics include: logarithmic and exponential functions, increasing and decreasing sequences (in Section 1.4), geometric and arithmetic sequences (Section 1.4), number of digits required to represent a number (Section 1.6), summation notation (Section 4.9), geometric and arithmetic sequences (Section 4.10), sequences defined by recurrence relations (Section 4.10), Fibonacci sequence (Section 4.11), well-ordering principle (Section 4.11), unions and intersections of sequences of sets (Section 5.2), graphs (Section 6.3). Parts of the zyBook to be ignored are clearly indicated by instructor notes.

### *Other Textbooks*

- 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 (5% BONUS)*
Before the start of every lecture, you will be expected to read some sections of the zyBook and complete the related participation and challenge activities. This reading assignment, which will help you understand the lecture, will be indicated at the bottom of the last slide covered in the previous lecture. Activities can be completed anytime. However, at exactly 11:30am (Section 1) or 2:30pm (Section 2) on any given Tuesday, a mark of zero will be recorded for any activity that was supposed to be completed before the lecture that day, or before the previous Thursday's lecture, and that has not been completed yet. Excuses for missed activities and requests for extensions will not be entertained.

*Quizzes (10%)*
There will be 11 quizzes, equally weighted. The two quizzes with the lowest marks will be ignored. All the quiz questions will be multiple choice questions on the material covered in the two previous lecture classes. Excuses for missed quizzes will not be entertained. Note that you will need an i>clicker for the quizzes. You can purchase an i>clicker at the University Bookstore. Please register your i>Clicker with the University of Guelph, NOT at iclicker.com. See:
https://opened.uoguelph.ca/instructor-resources/clickers

*Assignments (20%)*
There will be 4 assignments. Each assignment counts for 5% of the final grade. Note that the assignments are not programming assignments. The submissions are in the form of hard copies

and are due at the very start of the lecture. 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, with all supporting documentation. The only remedy available for missed assignment is redistribution of its weight to other components (at the discretion of the instructor). Please keep your assignment papers until the end of the semester, as you may be asked to resubmit work at any time.

*Midterm Examination (30%)*
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. 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). Please keep your midterm examination paper until the end of the semester, as you may be asked to resubmit work at any time.

*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.

## *Remarking Policy*

Any request for remarking must be submitted within ONE WEEK after the marks have been posted on *CourseLink*. You are therefore encouraged to take a look at the solutions as soon as possible, and to make sure your paper has been correctly marked and your mark correctly recorded. The requests must be submitted to the course instructor, in writing, using the remarking form (http://www.socs.uoguelph.ca/~matsakis/CIS1910/remark.pdf) with the complete original marked exam or assignment. Note that a remark may result in changes to marks assigned to other questions, and may lower the total marks.

## *Dates and Deadlines*

*Participation and challenge activities*
Before the start of every lecture, except the first.

*Quizzes*
Every Tuesday at 11:30am (Section 1) or 2:30pm (Section 2), from Jan 15 to Apr 2, except Feb 19. Do not forget your i>clicker, or a mark of zero will be recorded.

*Other Components*

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|---|---|
| Assignment 1 due by 11:30am (Section 1) or 2:30pm (section 2): | Jan 24 (Thursday) |
| Assignment 2 due by 11:30am (Section 1) or 2:30pm (section 2): | Feb 07 (Thursday) |
| Midterm examination in ROZH 101, from 10:00am to 11:30am on: | Mar 2 (Saturday) |
| Assignment 3 due by 11:30am (Section 1) or 2:30pm (section 2): | Mar 21 (Thursday) |
| Assignment 4 due by 11:30am (Section 1) or 2:30pm (section 2): | Apr 4 (Thursday) |
| Final examination from 8:30am to 10:30am on: | Apr 16 (Tuesday) |

## *Academic Integrity*

You are expected to work on each problem on your own and present your own solution. You may use textbooks, lecture notes, lab notes, instructors, tutors and classmates to help you find general strategies to solve the problems, but you may not go out and find complete solutions to the

problems. You may discuss the strategies to solve these problems with your fellow students, but you may not discuss complete solutions.

Do NOT take written notes away from a discussion with another student, do NOT use in any way somebody else's written solutions, do NOT lend your homework or your i>clicker, or you may face stiff academic penalties. Note that markers have been told to be alert for instances of fraud. If you are unsure whether an activity may constitute plagiarism or undue collaboration, consult the instructors immediately. You are encouraged to review the University's policy on academic integrity: https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

## *Standard Statements*

### *E-Mail Communication*

All students are required to check their <uoguelph.ca> email account regularly. Use your <uoguelph.ca> account (not any other account) to contact the instructors. Start the subject of your message with the number 1910.

### *Office Hours*

The instructors are at your disposal during the scheduled office hours. Please feel free to come see them as often as you want, whether you need help with the lecture material, the lab material, or with an assignment. If you need to see an instructor outside the office hours, please send an email and make an appointment.

### *Electronic Devices*

The use of any electronic devices other than i>clickers (e.g., laptops, tablets, mobile phones, cameras, audio recorders, video recorders) is not permitted during lectures and labs. However, exceptions may be granted at the discretion of the course instructor (please send an email and make an appointment).

Presentations which are made in relation to course work—including lectures—cannot be audio- or video-recorded without the permission of the presenter, whether an instructor, a classmate or guest lecturer.

### *Tutoring*

Tutoring At Guelph (https://www.uoguelph.ca/tutoring/) 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.

### *Drop Date*

The last day to drop CIS*1910 is Mar 8, 2019. For requests to drop after the deadline because of extenuating medical, psychological, or compassionate considerations, see: https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

### *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 book their exams at least 7 days in advance, and not later than the 40th Class Day. Please see: http://www.uoguelph.ca/sas

### *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.