

DISTRIBUTED COMPUTING

COMP 4001 (September 2, 2020)

Evangelos Kranakis
(kranakis@scs.carleton.ca)

1 DELIVERY METHOD

Synchronous course, meetings via web conferencing tools on Zoom at scheduled time. The video conference link for the lecture is posted at the course web page on CU Learn. Homework, assignments and other activities will be completed outside of class and submitted on CU Learn. Students are expected to be available during the synchronous meeting times.

2 CONTACTS

- Evangelos Kranakis, Office 5360 HP, Office hrs Tue & Thu 10:15 am to 11:15 am
- TA (Email) [Office Hours]
 - Ryan Killick (RyanKillick@cmail.carleton.ca) [TBA]
 - Nicolas Perez (nickperez@cmail.carleton.ca) [TBA]
 - Zijian Zhen (zijianzhen@cmail.carleton.ca) [TBA]
- TA Office Hours are held via web conferencing tools.

3 COURSE DESCRIPTION

This is an introductory course in Distributed Computing. Topics include:

- Computational models, communication complexity,
- design and analysis of distributed algorithms and protocols,
- fault-tolerant protocols, synchronous computations.
- Applications may include: communication in data networks, control in distributed system (e.g., election, distributed mutual exclusion), manipulation of distributed data (e.g., ranking).

Prerequisite(s): COMP 1805 with a minimum grade of C-, COMP 2401 and COMP 2406 or SYSC 4504.

CONTENTS OF LECTURES

1. **Week 01:** Sep 16 Introduction; Overview;
2. **Week 02:** Sep 23 Coloring; Dominating Set; (**Assignment A**)
3. **Week 03:** Sep 30 ID Selection; Leader Election 1;
4. **Week 04:** Oct 07 Leader Election 2;
5. **Week 05:** Oct 14 Search, Evacuation (**Assignment B**)
6. **Week 06:** Oct 21 Connections (**Quiz 1**)
 Oct 26-30 Fall Break
7. **Week 07:** Nov 04 Locality;
8. **Week 08:** Nov 11 Broadcasting;
9. **Week 09:** Nov 18 Trees in DC; (**Assignment C**)
10. **Week 10:** Nov 25 Message Passing **Quiz 2**
11. **Week 11:** Dec 02 Fault Tolerance;
12. **Week 12:** Dec 09 Shared Memory;

NB: Material covered in lectures may vary slightly depending on time available. Lecture Notes (labeled LEC) and Class Notes (labeled CLA) in PDF are posted in CULearn before and after the lecture, respectively, in a timely manner. Audio and video recordings will not be provided unless it becomes necessary.

4 STUDENT REQUIREMENTS

Following are the requirements for the course.

GRADING & COURSE WORK

Type of Test	#	% Each	% Total	Where
Assignments	3	10%	30%	Homework
Quiz 1 (30 min)	1	20%	20%	In Class
Quiz 2 (30 min)	1	20%	20%	In Class
Final (60 min)	1	30%	30%	TBA

TESTS

Quizzes and Tests will be web based.

- Quizzes 1 & 2: quiz questions based on everything that we covered in class up to and including the last lecture prior to this quiz. You should be familiar with all the material covered from the beginning of the course.
- Final: you should study everything that we covered in class.

Additional Details & Requirements

1. All assignments are compulsory and must be uploaded to the course web site in CU Learn on the due date and time. Submit only in pdf format (DO NOT SUBMIT zip, wordperfect, etc.) It is preferable for the assignments to be typed. Late assignments will not be accepted. Assignments will be submitted through CULearn's course web site. Missing assignments are worth 0%.
2. Plagiarism will not be tolerated. You must always write up the solutions to assignment problems on your own and acknowledge your sources in case you used library material. On the first occasion, plagiarizing an assignment will result in assigning a 0 to all the students involved and continuation of this practice may have severe repercussions for the student(s) involved.
3. Avoid posting code and/or solutions of assignments online on github and other places in the cloud. Other students have found that code and plagiarized their assignments and projects. Students posting their code and/or solutions assignments online are making themselves a potential party to plagiarism.
4. Class attendance and participation is encouraged and highly recommended because additional material could be discussed and clarified. Office hours should be used by the students.
5. Make-up tests are not possible.

5 USEFUL BOOKS (Not Required)

Your study should be based on the lecture notes (labeled LEC) as well as class notes (labeled CLA) and additional material provided. Although I will not follow any of the books below you can use them as a guide for supplementary material and further study. Additional material on each topic can also be found on the internet.

1. H. Attiya, J. Welch, Distributed Computing, Wiley, 2E, 2004.
2. F. Bullo, J. Cortes, S. Martinez, Distributed control of robotic networks: a mathematical approach to motion coordination algorithms, Princeton University Press, 2009.
3. D. Gordon, Ant Encounters: Interaction Networks and Colony Behavior, Princeton University Press, 2010.
4. E. Kranakis, D. Krizanc, and E. Markou, The Mobile Agent Rendezvous Problem in the Ring, Morgan-Claypool, 2010.
5. N. Lynch, Distributed Algorithms, Morgan-Kaufmann, 1996.
6. D. Peleg, Distributed Computing A Locality Sensitive Approach, SIAM, 2000.
7. N. Santoro, Design and Analysis of Distributed Algorithms, Wiley, 2007.
8. G. Taubenfeld, Distributed Computing Pearls, Morgan-Claypool, 2018.
9. R. Wattenhoffer, The Science of the Blockchain, 2017.

You can purchase the books either from any commercial bookstore. Use also information available in the internet or in numerous other books.

Additional Useful Information

Important Considerations

“Late assignments are never accepted for any reason. Assignments submissions are handled electronically (i.e., through cuLearn) and there is no "grace period" with respect to a deadline - an assignment submitted even one minute after the deadline is late and will receive a mark of zero.

Undergraduate Academic Advisor

The Undergraduate Advisor for the School of Computer Science is available in Room 5302C HP; by telephone at 520-2600, ext. 4364; or by email at undergraduate_advisor@scs.carleton.ca. The undergraduate advisor can assist with information about prerequisites and preclusions, course substitutions/equivalencies, understanding your academic audit and the remaining requirements for graduation. The undergraduate advisor will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services and Writing Tutorial Services.

SCS Computer Laboratory

SCS students can access one of the designated labs for your course. The lab schedule can be found at: <https://carleton.ca/scs/tech-support/computer-laboratories/>. All SCS computer lab and technical support information can be found at: <https://carleton.ca/scs/technical-support/>. Technical support is available in room HP5161 Monday to Friday from 9:00 until 17:00 or by emailing support@scs.carleton.ca.

University Policies

For information about Carleton's academic year, including registration and withdrawal dates, see [Carleton's Academic Calendar](#).

Pregnancy Obligation. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit [Equity Services](#).

Religious Obligation. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit [Equity Services](#).

Academic Accommodations for Students with Disabilities If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting

accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the [Paul Menton Centre](#) website.

Survivors of Sexual Violence. As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities. Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see [the policy](#).

Student Academic Integrity Policy. Every student should be familiar with the Carleton University student academic integrity policy. A student found in violation of academic integrity standards may be awarded penalties which range from a reprimand to receiving a grade of *F* in the course or even being expelled from the program or University. Examples of punishable offences include: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found [here](#).

Plagiarism. As defined by Senate, "plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own". Such reported offences will be reviewed by the office of the Dean of Science.

Unauthorized Co-operation or Collaboration. Senate policy states that "to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis". Please refer to the course outline statement or the instructor concerning this issue.