DISTRIBUTED COMPUTING
COMP 4001 (September 1, 2021)

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 in Brifgtspace. Homework, assignments and other activities will be completed outside of class and submitted in Brifgtspace. Students are expected to be available during the synchronous meeting times.

2 CONTACTS

- Evangelos Kranakis, Office 5360 HP,
  Office hrs Tue & Thu 10 am to 11 am (via Zoom Link)
- TA (Email) [Office Hours]
  - Nooshin Nokhanji (nooshinnokhanji@cmail.carleton.ca) [TBA]
  - Thiago da Silva Gomides (gomides@ufsj.edu.br) [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:** Introduction; Overview;
2. **Week 02:** Coloring; Dominating Set; **(Assignment 1)**
3. **Week 03:** ID Selection; Leader Election 1;
4. **Week 04:** Leader Election 2; **(Quiz 1: Wed Sep 29**)
5. **Week 05:** Group Search
6. **Week 06:** Connections **(Assignment 2)**
7. **Week 07:** Locality;
   Oct 25-29 Fall Break
8. **Week 08:** Broadcasting; **Quiz 2: Wed Nov 03**
9. **Week 09:** Trees in DC;
10. **Week 10:** Message Passing; **(Assignment 3)**
11. **Week 11:** Fault Tolerance; **Quiz 3: Wed Dec 01**
12. **Week 12:** Shared Memory;
13. **Week 13:** Distributed Sorting;

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 Brifgtspace before and after the lecture, respectively, in a timely manner. Live video recordings of the lectures will also be provided.

4 ASSESSMENT AND REQUIREMENTS

Following are evaluation details and requirements for the course.

Grading and Course Work

Type of Test	**#**	**% Each**	**% Total**	**Where**
Assignments	3	12%	36%	Homework
Quiz 1 (20 min)	1	13%	13%	In Class
Quiz 2 (20 min)	1	13%	13%	In Class
Quiz 3 (20 min)	1	13%	13%	In Class
Quiz 4 (40 min)	1	25%	25%	TBA

Quizzes and Assignments

The purpose of **Quizzes** is to help you review the material covered in class in a timely manner. Quiz questions are 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. Quiz questions are generally simpler than assignment questions. Quizzes will be scheduled during class time except for the last quiz which will be scheduled at a later time. All quizzes will be web based.

The purpose of **Assignments** is to understand deeper material related to issues discussed in class. Assignments are homework based. From the day an assignment is handed out, you will have about three weeks time to complete and submit them.

Additional Details

- **Assignments**

    1. All assignments are compulsory and must be uploaded to the course web site in Brightspace 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 Brifgtspace's course web site. Missing assignments are worth 0%.
    2. You are expected to work on your assignments consistently once they are released. As a result, the instructor does not grant exemptions for the assignments. Under extenuating circumstances, if you are seeking additional accommodations for your assignments (perhaps due to an ongoing medical issue, for instance), you may petition the Associate Dean's office.
    3. 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.
    4. 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.

- **Quizzes**

    1. Make-up quizzes are not possible. In case you miss any one of the quizzes 1 to 3 the quiz grade will be averaged, but to qualify you must submit a critical analysis (5 pages, double-spaced) of the topics covered (within two weeks from the date the quiz was held) for that quiz and get a passing grade. (This includes any absences for medical reasons.) Failing to do so you get 0% grade. This rule applies to at most one quiz.

- **Attendance**

    1. Class attendance and participation is encouraged and highly recommended because additional material is being discussed and clarified in class.
    2. Office hours are held by the instructor and the TA on a regular basis and students are encouraged to make use of them.

5 USEFUL BOOKS (Not Required)

Your study should be based on the lecture notes (labeled LEC) as well as class nores (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.