ECE 406, Winter 2021, Syllabus, Logistics and Schedule

Algorithms are at the very foundations of computing. It is important that one understands how to design them, and analyze them for correctness and efficiency. It is important also that one recognizes whether a problem is intractable so one does not naively seek an efficient algorithm when none may exist. The intent of this course is to provide students with fundamental training in these aspects.

Prerequisite	ECE 250 or an equivalent http://www.ucalendar.uwaterloo.ca/1920/COURSE/course-ECE.html#ECE250
Antirequisite	ECE 606 https://uwaterloo.ca/graduate-studies-academic-calendar/node/7055
Live communication	Via MS teams. For my office hours MF 1-2:20, I will have a team created for the course.
Lectures	Pre-recorded, uploaded to Learn by Monday I will be available live 1-2:20MF on MS teams. One of your TAs suggests that you watch the lectures during those times so you can ask me questions live.
Instructor	Mahesh Tripunitara, tripunit@uwaterloo.ca "Mahesh" "Dr. T" "Prof. T" Office hours: Live, on MS Teams; 1-2:20MF Or by appointment — email me to set up.
TAs *For issues regarding assignments only*	Rowan Dempster, r2dempst@uwaterloo.ca Arnab Ghosh, a43ghosh@uwaterloo.ca Siddharth Priya, s2priya@uwaterloo.ca
Course materials	learn.uwaterloo.ca
Textbook	Dasgupta, Papadimitriou & Vazirani, "Algorithms" https://www.amazon.ca/Algorithms-Sanjoy-Dasgupta/dp/0073523402
Discussions	piazza.com/uwaterloo.ca/winter2021/ece406
Marking	Assignments every 3 weeks, total of 4: 50% ◦ Formative assessment Final exam: 50% ◦ Summative assessment I will use Crowdmark for the assignments and the final exam; https://uwaterloo.ca/crowdmark/
Audit	All deliverables (assignments + final exam) must be met. A mark of 50 on the course must be achieved.
AccessAbility	uwaterloo.ca/accessability-services
Academic Integrity	uwaterloo.ca/academic-integrity $\longrightarrow$ Students
Recipe for success	◦ Keep up — $\sim$ 15 pages from textbook per week ◦ Work on assignments by yourself — easy grading ◦ Course exercises basic math and logic only

Content + Schedule

Week	*Topics*	*Textbook sections*
(1) Jan 11	Intro to the course, prologue, basic arithmetic	0.1–0.3, 1.1
Assignment 1 published Tue, Jan 12		
(2) Jan 18	Algorithms with numbers, continued	1.2–1.4
(3) Jan 25	Universal hashing, divide-n-conquer	1.5, 2.1–2.5
(4) Feb 1	Decompositions of graphs, paths	3.1–3.4, 4.1–4.2
Assignment 1 submissions due Tue, Feb 2 Assignment 2 published Tue, Feb 2		
(5) Feb 8	Paths in graphs, contd.	4.3–4.7
Feb 15 – 19, reading week		
(6) Feb 22	Greedy Algorithms	5.1–5.3
(7) Mar 1	Set cover, Dynamic programming	5.4, 6.1–6.5
Assignment 2 submissions due Tue, March 2 Assignment 3 published Tue, March 2		
(8) Mar 8	Shortest paths, Independent sets in trees, Linear programming	6.6–6.7, 7.1
(9) Mar 15	Circuit evaluation, NP-completeness	7.7, 8.1–8.2
(10) Mar 22	Reductions	8.3
Assignment 3 submissions due Tue, March 23 Assignment 4 published Tue, March 23		
(11) Mar 29	Coping with NP-completeness	9.1–9.3
(12) Apr 5	Review	-
Assignment 4 submissions due Tue, April 13		
Apr 17 – 26, final exam		

Our textbook is: Dasgupta, Papadimitriou & Vazirani, "Algorithms," `https://www.amazon.ca/Algorithms-Sanjoy-Dasgupta/dp/0073523402`. We will cover 43 of the 56 sections in the textbook. I would have liked to cover the entire textbook — it is an excellent textbook for a course of this nature; credit to my colleague Stephen Smith, `https://ece.uwaterloo.ca/~sl2smith/`, for picking it for this course. As the preface says, the textbook is based on comparable courses at the UCs Berkeley and San Diego, which are on a semester system. Our terms are about 3/4 the duration of their semesters. And $43 \simeq 56 \times 3/4$. All my lectures, accompanying notes, the assignments and the final exam are based on the sections of the textbook we cover in this course. Once you go through this course, you should certainly be able to read the other portions of the textbook on your own. Indeed, you should be well prepared to take more advanced courses on algorithms, or learn more on your own.

Assignments

We will have an assignment due about every three weeks for a total of 4 assignments — see exact dates in the table on the previous page. Each assignments comprises a few problems. There may be problems in the assignment that involve programming in Python 3; each such problem will be annotated with "[**python3**]." Assignments will be published by midnight Tuesday. Each is due Tuesday before midnight 3 weeks after. The assignments will be published via Crowdmark `https://app.crowdmark.com/sign-in/waterloo`. The instructions will be clear — written portions of your submissions are to be made to Crowdmark and Python 3 submissions are to be made to a clearly designated dropbox on Learn.

Marking of assignments and solution keys: The assignments, taken together, are worth 50% of your mark in the course. Depending on TA-resources, the TAs may mark a subset of the problems only for course-credit. This subset will not be announced beforehand. Marking will be easy so you really should take the opportunity to work on them on your own to learn the material. I will publish my solutions to the assignments after. My solutions will be for all the problems; not only the ones the TAs end up marking.

Escalation process: If you are unhappy with the manner in which your assignment has been marked, please first contact the TAs, e.g., via email to all of them, with your issue(s). If the resolution with them is unsatisfactory, then you can always bring it up with me after.

Lateness policy: no late submissions accepted.

Collaboration policy: you may collaborate with your colleagues when working on your assignments in that you can discuss ideas with one another. However, your final submission must be your own. That is, when you sit down to write your solutions down, you should do so on your own. Any sources you use, whether they are your colleagues, books, papers or online resources, should be appropriately credited in your submission. There is no penalty for utilizing such (re)sources, provided they are credited explicitly. Otherwise, it is regarded as plagiarism, and is an academic offence.

Originality detection: We will be using software in this course to check that your submissions are indeed original. Your confidentiality will be protected fully. You are allowed to use/cite resources in your assignments; you should clearly and fully credit such resources, whether they be websites, papers, books or your colleagues.

Final Exam

The final exam, worth 50% of your course-mark, will be administered via Crowdmark. You will be free to use any resources, e.g., books/papers/online resources, that you like. As always, you should credit any (re)source you use in your solutions. Outside of such resources, the final exam must be your own, individual work, with no collaboration with any other living being whatsoever. The final exam is intended to be a "summative" assessment and will be marked fairly, but not liberally as the assignments are. I will publish more details on the logistics of the exam a few weeks into the course, once I know.