CSC 420-01, Theory of Computation

MWF 1:00-1:50am, Academic Center 219

Instructor: Dr. Amy DeCelles

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Office Hours*: M 3-3:50, Tu 10-10:50, W 2-2:50, Th 1-1:50, F 3-3:50

**If you anticipate wanting to come to office hours regularly, and none of these times work for you, please email me about this within the first week of the semester.*

Course Description: Covers the detailed comparative analysis of algorithms and their computational complexity. May also include formal language theory including finite automata, Turning machines, context-free grammars, and decidability. Three lectures a week.

Course Prequisite: MATH 210 and (CSCC 122 or ITSC 122)

Credits and Workload Expectations: 3 credits, 6 hours per week outside the classroom.

Course Materials and Resources:

- *Introduction to the Theory of Computation*, 3rd edition, Michael Sipser
- Canvas. Notes and other information will be posted there. Students are expected to check Canvas (and Bethel email) regularly.
- Learning Commons: lower level of the Miller/Moore Academic Center (AC)

Course Goals: To experience the theoretical underpinnings of computing, understand proofs, automatas and grammars, Big-O, P/NP/etc.

Course Objectives: Upon successful completion of this course, students will understand . . .

- the theory of computer science,
- Big-O notation,
- N/NP problems, and
- how to deal with complex material.

Program Objectives: This course supports the following computing program objectives:

- Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. (CS student outcome 1)
- Apply computer science theory and software development fundamentals to produce computing-based solutions (CS student outcome 6)

Course Structure: This course is designed to help you progress from a basic understanding of the material (obtained by reading the textbook and answering questions), to a working understanding (by preparing and discussing problems with classmates), to a mastery understanding (by writing up problems for a portfolio). Class time is used for clarifying and deepening understanding, through brief lectures and group discussion. Note that the reading questions for a given topic are typically due *the class before the topic is covered*; drafts of discussion problems for a topic are due at the beginning of class on the day that a topic is covered. (For example, we will cover 0.2B in class on Fri Jan 21; RQ 0.2B is due Wed Jan 19, and D 0.2B is due Fri Jan 21.) If you have not taken a class requiring significant advance preparation, it will likely take some time (about 3 weeks) to adjust to this structure, but, in my experience, students usually find this structure very beneficial once they have found their stride.

Collaboration and Consultation: I encourage you, when working on homework, to collaborate with fellow students, to reread the textbook, and to ask the professor for help. You are also free to consult other textbooks or online resources for general information on the topic. However, *you may not at any point consult any worked solution to an assigned homework problem.* This includes but is not limited to: other students' written homework and any online solution. If in doubt about the acceptability of a certain kind of collaboration or consultation, ask the professor. Please see the university policy on academic dishonesty, below.

Attendance: Attendance in class is expected, and a portion of the final grade comes from preparation for and participation in class. Absences for official university functions will be excused, provided that the instructor is notified in advance. Absences due to qualifying family or medical emergencies will also be excused, though the instructor reserves the right to ask for verification. *In the case of an excused absence, it is the student's responsibility to contact the instructor in a timely fashion and make arrangements for an assignment to compensate for the missed discussion participation.*

Late Work: Written work is due at the beginning of class on the date it is due; online assignments are due 15 minutes before the start of class. Late work is typically not accepted. The lowest scores in each daily category (RQ and D) will be dropped at the end of the semester. Moreover, each student may have one "no questions asked" 24-hour extension on a problem portfolio; the request must be received within 2 hours of the original deadline. Extensions on other assignments will be considered if requested before the due date, and work may certainly be submitted before the due date, if arrangements have been made with the professor in advance. If there is a serious, unforeseeable reason for missing more than one week of class, it is the student's responsibility to contact the professor as soon as possible and to make an appointment with the professor upon returning to classes to make a plan, e.g. whether to continue with the course, take an incomplete, or withdraw; and if continuing, how to make up missed work.

Missed Exams: Make-up midterm exams may be given to students with legitimate excuses such as serious illness, university sponsored events, etc., as long as the make-up exam can be taken within a reasonable time frame. If it is not possible to schedule a make-up exam within a reasonable time frame, the grade for the midterm exam may be prorated from the final exam. Written documentation may be required. Rescheduling the final is not possible except under very extreme circumstances.

Incompletes: Grades of I are normally not given in this course. However, they may be granted due to extenuating circumstances if (i) at least 60% of the course work has been completed at a

level of C or better and (ii) the student demonstrates the ability to complete the remaining coursework outside of the classroom. In such cases, a well-documented petition should be submitted to the professor well before grades are due to the Registrar. Please see the university policies on incomplete grades and withdrawing from a class.

Final Course Grade: The overall score for this course will be computed as outlined below.

- Reading Questions (10%): summarizing and reflecting on readings for upcoming classes
- Discussion Preparation and Participation (10%): drafting solutions to discussion problems before class and participating in class discussion
- Chapter Portfolios (40%): revise and carefully explain several discussion problems (to be selected from a list of options) and reflect on what you learned
- Midterm Exam (15%): tentatively scheduled for Wed Mar 16
- Final Exam (25%): cumulative; scheduled for Wed May 4, 1-3pm

Final letter grades will be determined from the overall score as follows:

A	93-100	B+	87-89	B-	80-82	C	73-76	D+	67-69	D-	60-62
A-	90-92	B	83-86	C+	77-79	C-	70-72	D	63-66	F	0-59

Learning Commons: Located on the lower level of the Miller/Moore Academic Center (AC), the Learning Commons offers in-person and online tutoring services to all Bethel students, including help with any sort of writing projects, from conception to completion. Tutors are trained to give thoughtful feedback and advice on a variety of study skills, understanding concepts pertaining to relevant coursework, and overall writing concerns.

DEI: Bethel University respects the dignity of all God's image-bearers, and stands against racism, prejudice, and discrimination. Because Christ calls us to love our neighbor as ourselves, Christian discipleship includes pursuing the good of those who suffer injustice due to their color, race, or ethnicity. Therefore, we aim to continually transform our classrooms into safe and hospitable spaces where we listen to one another with mercy, learn from and value each other with tenacity, and commit to pursuing justice for the most vulnerable in our community.

Accessibility and Accommodations: Bethel University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, please contact the Center for Academic Success to discuss options. To schedule an appointment, email `rachel.kennedy@betheluniversity.edu` or call 574-807-7460.

Academic Dishonesty: The student handbook (p. 156) states: "Any act of deceit, falsehood or stealing by unethically copying or using someone else's work in an academic situation is strictly prohibited.

1. A student found guilty of plagiarism or cheating will receive an "F" (zero) for that particular paper, assignment or exam. Should this occur, the professor will have an interview with the student and will submit a written report of the incident to the academic dean.

2. If a second offense should occur, the student will be asked to appear before the professor, the academic dean and the vice president for student development.

The student should realize that at this point continuation in a course and even his/her academic career may be in jeopardy. In the event of a recommendation for dismissal, the matter shall be referred to the Student Development Committee."

Cell Phones: Cell phones must be turned off and stowed in book bags during class. Any student using a cell phone for any reason (without permission) will be asked to leave the class and an unexcused absence will be recorded. Students using cell phones during exams or graded activities may be cited for cheating (at professor's discretion). In the case of expected emergencies, students may seek permission from the professor to leave their cell phones on during class, but the phone must remain in the book bag. Professors reserve the right to have operational cell phones in class.

COVID-19: Students are expected to comply with current Bethel University COVID-19 Protocols and Procedures.

Disclaimer: This syllabus is not a legal contract, but serves as a general outline for the semester. The professor reserves the right to announce in advance necessary adjustments to the course as the need arises.

Tentative Schedule: A tentative semester schedule follows on the next page.

CSC 420, Theory of Computing, Spring 2022, Tentative Semester Schedule

Mon	Wed	Fri
Jan 10, 2022	Jan 12, 2022	Jan 14, 2022
		Intro/Preview
Jan 17, 2022	Jan 19, 2022	Jan 21, 2022
No class (MLK) Due: • RQ 0.1, 0.2A	0.1, 0.2A (p 1-7) Due: • RQ 0.2B, D 0.2A	0.2B (p 7-13) Due: • RQ 0.2C, D 0.2B
Jan 24, 2022	Jan 26, 2022	Jan 28, 2022
0.2C (p 13-16) Due: • RQ 0.3/0.4A, D 0.2C	0.3/0.4A (p 17-22) Due: • RQ 0.4B, D 0.3/0.4A	0.4B (p 22-25) Due: • RQ 1.1A, D 0.4B
Jan 31, 2022	Feb 2, 2022	Feb 4, 2022
Review Ch 0	1.1A (p 31-37) Due: • RQ 1.1B, D 1.1A	1.1B (p 37-47) Due: • RQ 1.2A, D 1.1B, **Ch 0 Portfolio**
Feb 7, 2022	Feb 9, 2022	Feb 11, 2022
1.2A (p 47-54) Due: • RQ 1.2B, D 1.2A	1.2B (p 54-63) Due: • RQ 1.3A, D 1.2B	1.3A (p 63-66) Due: • RQ 1.3B, D 1.3A
Feb 14, 2022	Feb 16, 2022	Feb 18, 2022
1.3B (p 66-76) Due: • RQ 1.4, D 1.3B	1.4 (p 77-82) Due: • RQ 2.1A, D 1.4	Review Ch 1
Feb 21, 2022	Feb 23, 2022	Feb 25, 2022
2.1A Due: • RQ 2.1B, D 2.1A	2.1B Due: • RQ 2.1C, D 2.1B, **Ch 1 Portfolio**	2.1C Due: • RQ 2.2A, D 2.1C
Feb 28, 2022	Mar 2, 2022	Mar 4, 2022
2.2A Due: • RQ 2.2B, D 2.2A	2.2B Due: • RQ 2.3, D 2.2B	2.3 Due: • RQ 2.4A, D 2.3
Mar 7, 2022	Mar 9, 2022	Mar 11, 2022
Spring Break	Spring Break	Spring Break
Mar 14, 2022	Mar 16, 2022	Mar 18, 2022
Review for 2.1-2.3	Midterm Exam	2.4A Due: • RQ 0.2C, D 0.2B
Mar 21, 2022	Mar 23, 2022	Mar 25, 2022
3.1 Due: • RQ 3.2A, D 3.1	3.2A Due: • RQ 3.2B, D 3.2A	3.2B Due: • RQ 3.3, D 3.2B
Mar 28, 2022	Mar 30, 2022	Apr 1, 2022
3.3 Due: • RQ 4.1, D 3.3	4.1 Due: • RQ 4.2A, D 4.1	4.2A Due: • RQ 4.2B, D 4.2A
Apr 4, 2022	Apr 6, 2022	Apr 8, 2022
4.2B Due: • RQ 7.1A, D 4.2B	Review Ch 3-4	7.1A Due: • RQ 7.1B, D 7.1A
Apr 11, 2022	Apr 13, 2022	Apr 15, 2022
7.1B Due: • RQ 7.2, D 7.1B, **Ch 3-4 Portfolio**	7.2 Due: • RQ 7.3, D 7.2	Easter Break
Apr 18, 2022	Apr 20, 2022	Apr 22, 2022
7.3 Due: • RQ 7.4A, D 7.3	7.4A Due: • RQ 7.4B, D 7.4A	7.4B Due: • RQ 7.5A, D 7.4B
Apr 25, 2022	Apr 27, 2022	Apr 29, 2022
7.5A Due: • RQ 7.5B, D 7.5A	7.5B Due: • D 7.5B	Review Ch 7