COT 4210-01 – Discrete Structures II - Spring 2021 Syllabus

Class Time: Tuesday, Thursday 1:30-2:45pm   **Class Location:** Online (Home)

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Course Web Page: http://www.cs.ucf.edu/courses/cot4210/spr2021/
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I do NOT check my WebCourses email. Please email me at dmarino@ucf.edu to contact me.

Course Objective

The true title of this course should be "Theory of Computation." We will examine different models of computation and determine their computational ability. For each model, we will look at specific problems that can be solved within a particular model of computation and other problems that can not be solved within that model. Our ultimate model will be the Turing Machine, which as far as any one knows, is a model as powerful as any computer that can be built, at least in terms of types of problems it can solve. (It's possible for a standard computer to solve problems *faster* than they could be solved on certain Turing Machine models, for example.) We will study which problems are solvable by a Turing Machine and which ones are not. Furthermore, we will differentiate between problems that can be solved on a standard Turing Machine in Polynomial time versus problems that can be solved on a non-deterministic Turing Machine in Polynomial time. For many of the latter problems, it is not known whether or not a standard Turing Machine exists to solve them in Polynomial time also. This background will lead to a solid understanding of the P=NP? question. Finally, we will briefly discuss the practical ramifications of the complexity class NP.

Recommended Textbook

Introduction to the Theory of Computation Third Edition by Sipser   ISBN-13: 9781133187790
(Note: You may obtain the first or second edition as well. The content covered in this course is adequately covered in both versions.)

Grading

The final letter grade will be based upon the items listed on the following page. Weekly homework assignments (10) and programming assignments (4) will be due over Webcourses. You are allowed to collaborate on the weekly problems at a high level but must produce your own write ups. All programs must be done in Java and must be done INDIVIDUALLY. For each of the quizzes and the final exam, the format will be discussed in class. Note: plus/minus grades will be issued, when deemed appropriate.

Item	Number	Percentage of Grade	Total Percentage
Homework Assignments	10	1	10
Programming Assignments	4	5	20
Quizzes	4	10	40
Final Exam	1	30	30

Homework Assignments
You may discuss the homework at a high level with others, but must write up the homework on your own. It is difficult to come up with novel exercises for this sort of material, thus, if someone tries hard enough, they can usually find solutions to problems posted online and can copy them. This happened one semester and I spent an hour of the final exam chewing students out over the matter. (I will tell this story in class one day as it's an important lesson.) Some of these questions are challenging, and if you approach collaborating on them in the right way, you can truly learn a great deal. (Naturally, the worst possible thing you can do is copy a solution to a problem on line. This leads to the least possible learning.) If I detect wide spread cheating on homework (not just high level discussions amongst students), then **I reserve the right to throw out the homework grade from the final grade calculation and replace the 10% in any way I see fit.** Just so you know that I am not bluffing, I did exactly this in my Spring 2020 COT 3100 class. (I threw out an entire exam grade where I detected wide-spread cheating.)

Programming Assignments
Though other professors of this class don't give programming assignments, I've found that having programming assignments helps make this overly theoretical material more tangible for students. To that end, I'll have four programming assignments that relate to topics in the course sprinkled throughout the term. These assignments will be stated in a programming competition style where test case formats are clearly delineated and each test case will have one correct answer. A majority of the grade assigned will be based on programs not crashing and producing the correct output. Thus, be **triple careful** to make sure that your code won't crash. To that end, I'll require students to use Java to code the assignments, since Java code runs more consistently from machine to machine. This requirement is largely to improve your grades. (I experimented in past semesters where I allowed students to use different programming languages and the data clearly showed that using Java conferred advantages to the student grade. So, to save you from yourself, I'll force everyone to do the programs in Java.)

Quizzes
I will split the class up into four major sections (Regular Languages, Context Free Languages, Turing Machines, and the class NP). There will be one quiz for each of these sections. Quizzes will occur on class days. The beginning of the quiz days will start with a Zoom call of about 30 minutes. The quiz will follow and be an assignment turned in over Webcourses. Since drawings are critical for this course, in order to take the quizzes, you must have a quick facility to take a picture of your written work and store the picture as a .pdf file. **Please make sure you find a way to do this and practice this before the first quiz.** I will post a quiz 0 on Thursday, January 14th, for you to practice this at the very end of class. You may use your course notes and the course web page as resources for the quizzes. You **may not collaborate with anyone.**

Final Exam
The final exam will be administered as several (probably 4) short assignments via Webcourses during the appointed final exam time period for our course (May 4, 2021 1 - 4 pm EST). Thus, the exam will basically be four back to back quizzes. You may use your course notes and the course web page as resources for the final exam. You **may not collaborate with anyone.**

COVID-19 Statement
Please read UCF's required statement about COVID-19 applicable to all syllabi this semester:

https://fctl.ucf.edu/teaching-resources/course-design/syllabus-statements/

I will record live lectures during each of the regularly scheduled class times. It is suggested that students watch the lectures when I give them, but not required. Students are required to watch the lectures within 24 hours of when they are given, to make sure they don't fall behind. If you view lectures in a location that has people outside of your "pod" who are potentially near you (less than 10 feet), please do wear a face mask while viewing.

On quiz days I will start the class recording live, but instead of lasting 75 minutes, it will only last about 30 minutes and then you'll have your quiz as a short assignment via Webcourses. These quizzes **have to be taken live (from home),** unlike watching the class recordings, which can be done at a later time at your convenience. If you need to take a make up quiz, you must request one **beforehand.**

If you become ill during the semester and are unable to continue doing work in the class, please email me and we can decide together what the most appropriate action would be (make up assignments during the semester, regular withdrawal, medical withdrawal or incomplete). If you are ill but can still work from home, there is no need to let me know, unless you believe you need some special accommodation.

Tentative Schedule

Week	Tuesday Class	Thursday Class	Sunday
Jan 11-15	1.1	1.2	**Homework #1 due**
Jan 19-22	1.2	1.3	**Homework #2 due**
Jan 25-29	1.4	1.4	**Homework #3 due**
Feb 1-5	Minimal DFAs	**Quiz #1**	**Homework #4 due**
Feb 8-12	2.1	2.2	**Homework #5 due**
Feb 15-19	2.3 (Guest Lecture)	2.4	**Program #1 due**
Feb 22-26	**Quiz #2**	3.1	**Homework #6 due**
Mar 1-5	3.2	4.1	**Program #2 due**
Mar 8-12	4.2	4.2	**Homework #7 due**
Mar 15-19	5.1	5.2	**Homework #8 due**
Mar 22-26	5.3	**Quiz #3**	**Program #3 due**
Mar 29-Apr 2	7.1, 7.2, 7.3	7.4	**Homework #9 due**
Apr 5-9	7.5	7.5	**Homework #10 due**
Apr 12-16	**SPRING**	**BREAK!!!**	
Apr 19-23	7.5	**Quiz #4**	**Program #4 due**
Apr 26-30	FE Review	**NO CLASS**	
May 3-7	**Final Exam 1 - 4 pm**		

All sections listed in this chart refer to sections of the textbook. Note that this is a **tentative** schedule. Changes may be made in class. For this reason, watching class lectures live is important. Also, some material may be pulled from other sources in lecture. Thus, it will be beneficial for you to take your own notes AND read the posted course notes.

Late/Make Up Quizzes and Assignments

If a student is unable to complete an assignment on time or take an exam on time due to a serious family, medical or work situation, he or she must contact the instructor **BEFORE** the due date and ask for an extension. Extensions will be granted in situations the instructor deems reasonable. If an emergency occurs that prevents contacting the instructor before the due date, then the student should contact the instructor as soon as possible and reasonable accommodations will be made.

Incompletes

Incompletes are reserved for students who have been disabled in the middle of the course (typically for a medical or family reason) and have successfully completed a majority of the course, but will need extra time to get well and complete the remainder of the work. **INCOMPLETES WILL NOT BE ISSUED TO STUDENTS WHO ARE DOING POORLY IN THE CLASS WHO WISH TO RAISE THEIR GRADE.** If you are doing poorly in the course and are worried about not passing, make an appointment with the instructor, and if necessary, drop the course, **BEFORE THE DROP DEADLINE, MARCH 26, 2021!!!**

Regarding being near the next grade

After the course is over, if you are .1% away from the next higher grade, **please do NOT send me an email asking to be given the next higher grade!!!** In a class with as many students as are in this class, there will **ALWAYS** be students near any grade boundaries I may choose to draw. Nonetheless, I must draw grade boundaries. (If I don't and everyone gets an 'A', then as far as the outside world is concerned, no one in the class is any better than the worst student in the class.) All such emails will be ignored. (Last semester, I spent about 10 hours answer these sorts of queries and it took away from the teaching and grading I did, which takes away from the quality of education all students receive. In short, my philosophy is that the rest of the students shouldn't suffer because of a few whiny students.)