CS 3530: Computational Theory

Fall 2021 Syllabus

An introduction to the theory of computation. Introduces theoretical computation models, along with a formal treatment of their capabilities and limitations. Topics include regular languages and finite automata, context-free languages and pushdown automata, Turing machines and the Church-Turing Thesis, decidability, and complexity, including NP-completeness. Students will complete written exercises.

Prerequisites

CS 2420, CS 2810, and CS 3310, each with a C- or better.

Course fees

Course fee: $20, used to assist in maintaining department infrastructure.

Sections

One section:

1. TR 12:00-1:15 pm in Smith 116
   CRN: 40814
   Final exam on Thursday, December 9 at 11:00 am -12:50 pm

Instructor

Instructor: Curtis Larsen

Email: larsen@dixie.edu

Phone: 435-652-7972

Office: North Burns 233

Office Hours: MTWR: 2:00-3:00 pm; or by appointment. (See Zoom link in Canvas.) (Spring 2021)

Objectives

At the end of the course, students will:

- Understand and be able to reason about the capabilities of various computational models.
- Be able to use formal notations and apply rigor in their analysis of formal systems.
- Recognize and understand different classes of computational complexity.
- Understand the limits of computational models and the real-world systems that rely on them.

Resources

Texts

There is one required text for this course. It is available from the campus bookstore:


You are welcome to use the second edition as well, which may be cheaper.

Computer labs

You may use the computers and software in the Smith Computer Center. Some lab assistants may be able to help with assignments and pass off homework assignments for introductory courses.
Assignments are all written, but must be prepared using LaTeX. Most students will use Overleaf to generate the required PDF documents. Students will be required to use GitHub repositories shared with the instructor to store the LaTeX source files, and submit PDF documents to Canvas.

Course web site

Assignment submissions and grades will be managed in the Canvas System.

Assignments and exams

Reading

The student is responsible for reading the material in the textbook. A reading schedule is provided with the class schedule on the course website. The student is expected to read the material before the class in which it is discussed. The book also includes material beyond what we will discuss in lecture, which you are encouraged to study on your own. Feel free to bring questions from the reading to lectures or to office hours.

Assignments

Assignments will be graded for correctness and elegance. It is important that you start early and get each of your assignments done before its due date. Many problems will take much longer to solve in a single sitting than in many shorter sessions. Give yourself time to think; sleep on difficult problems. Finish early so you can go back and refine your initial approach.

All assignments must be typed and handed in before class on the day they are due. Students are required to use LaTeX to prepare assignments. LaTeX is available on the Linux machines in the labs, and can be downloaded at no cost for use on any machine. If you use Ubuntu Linux, install the package texlive-full to get the complete distribution. The book Guide to LaTeX provides a complete introduction.

Note that technology problems are not acceptable excuses for late homework. You are responsible for typing and printing your assignments in advance of the deadline.

Exams

There will be several written exams, one at the end of part 1, one at the end of part 2, one after covering some part 3 materials, and a final. Topics from lectures, assigned readings, and lab work are all eligible for examination. Exams may include extensions of homework assignments, so be sure to keep copies of all of your work. Students are required to take all exams in order to pass the class.

Grading

Your assignment group score will be a floating point number between 0 and 1, found by adding up the number of assignment points obtained, and dividing by the number of possible assignment points.

The examinations are worth 100 points each. Your examination group score will be a floating point number between 0 and 1, found by adding up the number of examination points obtained, and dividing by the number of possible examination points.

Your course score will be a floating number between 0 and 1, found by multiplying your assignment group score and your examination group score.

Your course letter grade will be assigned based on treating your course score as a percentage and looking up the grade in the table below.

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<thead>
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<th>Minimum Percentage</th>
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Course policies

Attendance
Students are responsible for material covered and announcements made in class. School-related absences may be made up only if prior arrangements are made. The class schedule presented is approximate. The instructor reserves the right to modify the schedule according to class needs. Changes will be announced in class and posted to the website. Exams and quizzes cannot be made up unless arrangements are made prior to the scheduled time.

Occasional absences are acceptable as long as the student keeps up with assignment work. Students who miss more than two consecutive weeks of class or who miss more than 20% of scheduled classes during the semester without making prior arrangements will receive a failing grade. Students who miss any scheduled exam (including midterm exams and the final exam) or fail to complete a final project without making prior arrangements will receive a failing grade.

This course can only be completed by attending classes and completing all assigned work to a satisfactory level. There is no procedure for testing out of the class.

**Time Commitment**

Courses should require about 45 hours of work per credit hour of class. This class will require about 135 hours of work on the part of the student to achieve a passing grade, which is approximately 9 hours per week. If you do not have the time to spend on this course, you should probably rethink your schedule.

**Late Policy**

No late work is accepted. Assignments must be completed before the beginning of class on the day they are due. If you miss a class, you must submit your work before the scheduled class time to receive credit.

**Collaboration**

Limited collaboration with other students in the course is permitted. Students may seek help learning concepts and developing programming skills from whatever sources they have available, and are encouraged to do so. Collaboration on assignments, however, must be confined to course instructors, lab assistants, and other students in the course. Students are free to discuss strategies for solving programming assignments with each other, but this must not extend to the level of programming code. Each student must code his/her own solution to each assignment. See the section on cheating.

**Cheating**

Cheating will not be tolerated, and will result in a failing grade for the students involved as well as possible disciplinary action from the college. Cheating includes, but is not limited to, turning in homework assignments that are not the student’s own work. It is okay to seek help from others and from reference materials, but only if you learn the material. As a general rule, if you cannot delete your assignment, start over, and re-create it successfully without further help, then your homework is not considered your own work.

You are encouraged to work in groups while studying for tests, discussing class lectures, discussing algorithms for homework solutions, and helping each other identify errors in your homework solutions. If you are unsure if collaboration is appropriate, contact the instructor. Also, note exactly what you did. If your actions are determined to be inappropriate, the response will be much more favorable if you are honest and complete in your disclosure.

Where collaboration is permitted, each student must still create and type in his/her own solution. Any kind of copying and pasting is not okay. If you need help understanding concepts, get it from the instructor or fellow classmates, but never copy another’s code or written work, either electronically or visually. The line between collaborating and cheating is generally one of language: talking about solutions in English or other natural languages is usually okay, while discussions that take place in programming languages are usually not okay. It is a good idea to wait at least 30 minutes after any discussion to start your independent write-up. This will help you commit what you have learned to long-term memory as well as help to avoid crossing the line to cheating.

**College policies**

Click on this link: [https://academics.dixie.edu/syllabus/](https://academics.dixie.edu/syllabus/) for comprehensive information on the Semester Dates, the Final Exam Schedule, University resources such as the library, Disability Resource Center, IT Student Help Desk, Online Writing Lab, Testing Center, Tutoring Center, Wellness Center and Writing Center. In addition, please review DSU policies and statements with regards to Academic Integrity, Disruptive Behavior and Absences related to university functions.
If you are a student with a medical, psychological, or learning disability or think you might have a disability and would like accommodations, contact the Disability Resource Center (652-7516) in the North Plaza. The Disability Resource Center ([http://dixie.edu/drcenter/](http://dixie.edu/drcenter/)) will determine eligibility of the student requesting special services and determine the appropriate accommodations related to their disability.