SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Formal Languages and Computability Section 80

CS 154

Fall 2023   3 Unit(s)   08/21/2023 to 12/06/2023   Modified 08/21/2023

👤 Contact Information

Instructor: Ahmad Yazdankhah

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Office: Online

Course materials such as handouts, notes, assignment instructions, etc. can be found on *Canvas Learning Management System* available at https://sjsu.instructure.com.
Students are responsible for regularly checking with its messaging system (or other communication system as indicated by the instructor) to learn of any updates.

Office Hours

TR 15:30 - 16:30
Online, by appointment

Please send me an email 24 hours before your requested office hour time.

The best way to ask questions is opening a Canvas discussion or asking via the course Discord.

💻 Course Description and Requisites

Finite automata, context-free languages, Turing machines, computability.

Prerequisite(s): MATH 42 or MATH 42X and CS 46B (with a grade of "C-" or better in each); Allowed Declared Majors: Computer Science, Applied and Computational Mathematics, or Software Engineering. Or instructor consent.

Letter Graded

✳ Classroom Protocols

Consent for Recording of Class and Public Sharing of Instructor's Material

- Common courtesy and professional behavior dictate that you notify someone when you are recording him/her.
- You must obtain the instructor's written permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private study purposes only.
- The recordings are the intellectual property of the instructor.
- You have not been given any right to reproduce or distribute any material of this instructor unless you get written permission.

Online Class Protocol

- All microphones will be muted automatically when you join the Zoom meeting. If you have any questions, you need to unmute it and speak up or type your question in the chat room.
- The chat room will be private, and the instructor reads your questions loudly and answers them.

- We won't use a camera during the lectures but will use it during the exams. Therefore, you need to get dressed appropriately. The dress code is "Business Casual".
- Attendance is highly recommended, but is not mandatory, except for exams.

NOTE that University policy F69-24 available at http://www.sjsu.edu/senate/docs/F69-24.pdf states that:
"Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.
If a student has been out of school for one or more days, he/she should report to his instructors upon his/her return to inquire about making up the work. Students who know in advance that they will miss one or more classes should inform their instructors about their plans."

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students would be able to:

- Understand the high-level building blocks of computer science.
- Analyze and design deterministic and non-deterministic machines for various formal languages.
- Describe regular languages in terms of regular expressions and vice versa.
- Analyze and design pushdown automata for some formal languages.
- Analyze and design Turing machines for some formal languages.
- Describe the properties of various automata and formal
- Construct different type of grammars (regular, context-free, etc.) for some formal languages.
- Use the pumping lemma to prove that some formal languages are not regular.
- Describe decidability and classify problems as decidable or undecidable.
- Describe computability and complexity of problems.
- Categorize languages based on their complexities.
- Be familiar with some open-questions in computer science.

Course Materials

This course does not have a required textbook. My lecture notes contain all required materials.

Further Readings

1. Peter Linz, "*An Introduction to Formal Languages and Automata*," 5th edition, Jones & Bartlett Learning, ISBN-13: 978-1449615529
2. The references at the end of each lecture note.

Course Requirements and Assignments

- **Requirements**

  - A computer with microphone and camera is required for online activities (some lectures, office hours, online exams, etc.).

Teaching Style

- The lectures will be prerecorded and provided before the lecture time and students need to watch them before attending the class.
- In each lecture meeting, the lecture will be summarized, last week's assignment and exam will be solved, and students' questions will be responded. If time permits, extra examples will be solved.

Workload

- Success in this course is based on the expectation that students will spend at least 6 – 10 hours per week for:
  - Working on assignments.
  - Preparation for the exams (quizzes, midterms, and final).
  - Working on the term project.
- More details about student workload can be found in University Policy S16-9 available at http://www.sjsu.edu/senate/docs/S16-9.pdf.

✔ Grading Information

- There will be a weekly short quiz.
- There will be two midterms, and a final exam.
- There will be a term project and several individual assignments.
- All examinations would cover from the beginning of the semester.
- All examinations would be closed-all-materials.
- There won't be any makeup for the exams.
- To practice time management, **late submissions** will lose 20% of the total assignment score and an additional 20% for each 24-hour afterward.

Assignments	10%
Term Project	15%
Quizzes	30%
Midterm #1	10%
Midterm #2	15%
Final	20%
Total	**100%**

Nominal Grading Scale

From	To	Grade
97	100	A plus
93	96.99	A
90	92.99	A minus
87	89.99	B plus
83	86.99	B
80	82.99	B minus
77	79.99	C plus
73	76.99	C
70	72.99	C minus
67	69.99	D plus
63	66.99	D
60	62.99	D minus
0	59.99	F

🏛 University Policies

Per University Policy S16-9 (PDF) (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the Syllabus Information (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) web page. Make sure to visit this page to review and be aware of these university policies and resources.

📅 Course Schedule

Note: This is a tentative schedule and is subject to change but with fair notice.

Day#	Date	Lec#	Topics	Exams
1	08/22	0	Greensheet; A big picture of the course;	
2	08/24	1	Mathematical preliminaries (part 1);	Quiz 0
3	08/29	2	Mathematical preliminaries (part 2);	
4	08/31	3	Formal Languages	Quiz 1
5	09/05		Holiday: Labor Day	
6	09/07	4	Deterministic finite automata (part 1);	Quiz 2
7	09/12	5	Deterministic finite automata (part 2);	
8	09/14	6	Deterministic finite automata (part 3);	Quiz 3
9	09/19	7	Nondeterministic finite automata (part 1);	
10	09/21	8	Nondeterministic finite automata (part 2);	Quiz 4
11	09/26		Review, Study Guide, Q & A	
12	09/28		Esam: Mid 1	Quiz +
13	10/03	9	Regular languages	
14	10/05	10	Pushdown automata (part 1);	Quiz 5
15	10/10	11	Pushdown automata (part 2);	
16	10/12	12	Turing machines (part 1);	Quiz 6
17	10/17	13	Turing machines (part 2);	
18	10/19	14	Other mode and models of Turing machines	Quiz 7
19	10/24	15	Regular expressions (part 1);	
20	10/26	16	Regular expressions (part 2);	Quiz 8
21	10/31		Review, Study Guide, Q & A	
22	11/02		Esam: Mid 2	Quiz ++

Day#	Date	Lec#	Topics	Exams
23	11/07	17	Grammars (part 1);	
24	11/09	18	Grammars (part 2);	Quiz 9
25	11/14	19	Grammars (part 3);	
26	11/16	20	Non-regular languages (part 1);	Quiz 10
27	11/21	21	Non-regular languages (part 2);	
28	11/23		Holiday: Thanksgiving Day	
29	11/28	22	Introduction to computability;	
30	11/30	23	Introduction to complexity (part 1);	
31	12/05		Review, Study Guide, Q & A	

Final Exam

Date and Time	Fri, Dec 08 @ 2:45pm
Venue	Online