SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Formal Languages and Computability Section 02

CS 154

Fall 2023 3 Unit(s) 08/21/2023 to 12/06/2023 Modified 08/25/2023

Time: TuTh 9:00AM - 10:15AM

Classroom: Science Building 311

Instructor: Yan Chen

- Email: yan.chen01@sjsu.edu
- Office Hours
  - TuTh, 3:00PM - 4:00PM, Online: https://sjsu.zoom.us/j/81319625408 (https://sjsu.zoom.us/j/81319625408)
  - Or in person in DH282
  - Or by Appointment (https://calendly.com/yan-chen-sjsu/15min) (Zoom only, link same as above)

Grader: Kyaw Soe Han - kyawsoe.han@sjsu.edu (mailto:kyawsoe.han@sjsu.edu)

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

- Do NOT share any course material publicly (on Canvas, GitHub, etc.) without permission, including but not limited to lecture notes, lecture videos, passwords, homework/exam solutions, and class meeting links.
- No late homework questions (within 24 hours before due, excluding follow-ups) via email.
- For all homework and exams, only use the notations mentioned in the class. Wrong/different notation(s) will be considered as wrong answer(s).
- **Instances of academic dishonesty will not be tolerated**. Your own commitment to learning, as evidenced by your enrollment at San José State University and the University's Academic Integrity Policy (https://www.sjsu.edu/senate/docs/F15-7.pdf), requires you to be honest in all your academic coursework. Cheating or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit, or use of AI-generated text, etc.) will result in **a reduction in final course grade** (for assignments, one letter grade off every time except the first time; for the final, one letter grade off) and administrative sanctions by the University.

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 languages.
- 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

There is no required text for this course other than all the materials (lecture notes, homework, etc.) on Canvas. You are responsible for **regularly checking the Canvas course page** for any updates, including its messaging system.

Further Readings (optional)

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

Course Requirements and Assignments

There will be weekly assignments (optional), a midterm (optional) and a final (mandatory). No high-level programming is required in this course.

Although weekly assignments and midterm are optional, they are highly recommended to practice what you learned in class and to enhance your score. University Policy S16-9 (http://www.sjsu.edu/senate/docs/S16-9.pdf (http://www.sjsu.edu/senate/docs/S16-9.pdf)) states that:

> *"Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practice. Other course structures will have equivalent workload expectations as described in the syllabus."*

Canvas Quiz: Weekly Assignments

Assignments will be posted on Canvas every week, **locked by passwords that are ONLY given in the lectures**. They are optional, but points earned in those assignments will be extra points adding to the final score. See "Grading Information" for more details.

There will be two types of assignments (either one of below each week):

- Timed quizzes that are **closed-all-materials**. You can start the quiz any time before due, but must finish it in one sitting, within the time limit. They are cumulative with more focus on the material learned during that week.
- Design problems that are open notes with no time limit before due but more complex than those appear in timed quizzes.

Canvas Quiz: Midterm

The midterm will be held in class on October 12 (tentative). It will be posted on Canvas as a timed quiz, with more questions but less time per problem than normal assignments. No class meeting on the midterm day, but you need to finish the exam during the

required time frame. Exceptions may ONLY be given in cases of a verifiable emergency. You can view the midterm as a checkpoint and a practice for the final.

Canvas Quiz: Final Examination

The final will be in the same format as the midterm and is cumulative. The date and time are fixed: **Wednesday, December 13, 9:45 - 12:00 Pacific Time**. Exceptions may ONLY be given in cases of a verifiable emergency.

It can be substituted/averaged with a final project; more details will be given in class.

Both Midterm and Final are closed-all-materials.

The final Exam is mandatory as University policy S17-1 (http://www.sjsu.edu/senate/docs/S17-1.pdf (http://www.sjsu.edu/senate/docs/S17-1.pdf)) states:

> *"Faculty members are required to have a culminating activity for their courses, which can include a final examination, a final research paper or project, a final creative work or performance, a final portfolio of work, or other appropriate assignment."*

✔ Grading Information

Criteria

Note that the "weight" is not percentage - they are "points". There will be 130 points available, including extra credits from optional exercises/activities. More details will be given in class.

Type	Weight	Topic	Notes
Final Exam	100	Cumulative	Can be substituted with final project
(Optional) Midterm	3	Cumulative	3 pts if grade over 50% (all-or-nothing)
(Optional) Assignments	21	Weekly	14 assignments total, 1.5 pts each
(Optional) Others	6	Others	Other class activities, such as reading assignments, discussions, etc.

Breakdown

The range also refers to "points", not percentages.

- A+ will be given to the top 1% of students.
- Grades near the borderlines will be rounded up depending on your level and quality of class participation (in class and in the Discussions on Canvas).
- The grade might be curved ONLY if the final grades of the class at the end of the semester are not normal.

Grade	Range	Notes
A	Above 93	
A-	90 to 92.99	
B+	86 to 89.99	
B	83 to 85.99	
B-	80 to 82.99	
C+	76 to 79.99	
C	73 to 75.99	
C-	70 to 72.99	Passing grade

Grade	Range	Notes
D+	66 to 69.99	
D	63 to 65.99	
D-	60 to 62.99	
F	Below 60	Contact instructor if want a WU instead

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

Important dates

Visit https://www.sjsu.edu/registrar/calendar/fall-2023.php (https://www.sjsu.edu/registrar/calendar/fall-2023.php) for the Academic Calendar.

Date	Description
Aug. 22, Thursday	First Day of instruction (for this class)
Sep. 5, Friday	**Last day to drop without a W grade**
	Last day to add classes via MySJSU
Nov. 5, Sunday	Daylight saving time ends (at 2:00 AM Pacific Time)
Nov. 13, Monday	Last day to late drop/withdraw
Dec. 5, Tuesday	Last day of instruction (for this class)
Dec. 8, Friday	All class activities due except for final (for this class)
Dec. 11, Monday	**Final examination (for this class) 9:45 - 12:00 Pacific Time**
Dec. 20, Wednesday	Grades viewable on MySJSU

Lecture Schedule

Posted on Canvas: https://sjsu.instructure.com/courses/1572295/pages/course-materials (https://sjsu.instructure.com/courses/1572295/pages/course-materials)