COMP 454: Automata, Languages and Computation
Fall 2025

THIS IS A DRAFT SYLLABUS WHICH MAY BE UPDATED THROUGHOUT THE COURSE
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Instructor

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Course Information

COMP 454
Lecture time & place: Wednesdays 7:00–8:00
Prerequisites: MATH 300 and Python programming language
Co-requisites: None
General Education Areas: None

Catalogue Description

Study of the relation of languages (i.e. sets of strings) and machines for processing these languages, with emphasis on classes of languages and corresponding classes of machines. Phrase structure languages and grammar. Types of grammars and classes of languages. Regular languages and finite state automata. Context-free languages and pushdown automata. Unrestricted languages and Turing Machines. Computability models of Turing, Church, Markov, and McCarthy. Applications to programming languages, compiler design, and program design and testing.

Course Details

This course is an introduction to the theory of computation, from the point of view of languages over finite alphabets. We are going to start with Regular Languages, and the equivalence of several definitions: Finite Automata (deterministic and non-deterministic) and Regular Expressions (and applications to text search). The Pumping Lemma, and other approaches to showing that languages are not regular. We will continue with Context-free languages, and again the equivalence of several definitions: Context-free grammars and Push-Down Automata. We will finish with a version of the Pumping Lemma for Context-free languages. The final topic will be the Church-Turing thesis, and decidability.

Student Learning Outcomes (SLOs)

Upon successful completion of the course you will be able to:

1. Describe sets of strings with different computational models.
2. Understand the computational power of different computational models.
3. Understand the limits of computability.

Course Outline

Topics in order:

1. Regular languages [1st month]
2. Context-free grammars [2nd month]
3. Turing machines [3rd month]

Textbook

We are going to use chapter 8 of the following book (PDF to be provided by the instructor): 3rd edition of *An Introduction to the Analysis of Algorithms*, by Michael Soltys, published by World Scientific (ISBN: 978-981-3235-90-8). Algorithms and many solutions to problems can be found in https://github.com/michaelsoltys/IAA-Code.

Grading

1. Quizzes: 5% each, 8 quizzes
   Very useful for your own assessment of your understanding of the material, and as preparation for the midterm and to the final exam. To be given weekly.
2. Assignments: 5% each
   Four assignments to be completed individually, and are meant to reinforce the material in a deeper, hands-on, manner; please keep in mind the following:
   (a) First, it is part of solution development to have a back and forth between the instructor and the students, in order to understand fully the requirements and specifications. Thus, you should ask in class if anything about the assignment is not clear, as usually there are many implicit assumptions that must be made explicit.
   (b) Second, each solution will consist of a Python program, well documented with comments, submitted using GitHub classrooms. The details on how to do it will be given in class.
   (c) Third, it is ok to discuss the assignments with others, but no written notes should be taken out of such discussions.

3. Tests: 30%
   (a) Midterms: 10% each, two midterms
   (b) Final: 20% (cumulative, i.e., containing material from the entire course)

Grade determination

From	To	Letter Grade	From	To	Letter Grade
97	100	A +	77	79.99	C+
94	96.99	A	74	76.99	C
90	93.99	A-	70	73.99	C-
87	89.99	B+	67	69.99	D+
84	86.99	B	64	66.99	D
80	83.99	B-	60	63.99	D-
			0	59.99	F

Policies

1. **Academic Dishonesty:** By enrolling at CSU Channel Islands, students are responsible for upholding the University's policies and the Student Conduct Code. Academic integrity and scholarship are values of the institution that ensure respect for the academic reputation of the University, students, faculty, and staff. Cheating, plagiarism, unauthorized collaboration with another student, knowingly furnishing false information to the University, buying, selling or stealing any material for an examination, or substituting for another person may be considered violations of the Student Conduct Code (located at http://www.csuci.edu/campuslife/student-conduct/academic-dishonesty.htm). Application of the Policy on Academic Integrity (SP.19.001 or current version) to course grades: Instructors shall adhere to the general guidelines in the policy. If a student is found responsible for committing an act of academic dishonesty in this course, the student may receive academic penalties including a failing grade on an assignment or in the course, and a disciplinary referral will be made and submitted to the Dean of Students office.

   The assignments will be written in groups. Each group has to work independently of the other groups; verbal discussions of problems among groups are allowed, but you should not show written notes, and you should not leave such discussions with written notes. Please speak to the instructor if these expectations are not clear.

2. **Disability Statement:** If you are a student with a disability requesting reasonable accommodations in this course, please contact the student disability accommodations office. All requests for reasonable accommodations require registration with the accommodations office in advance of needed services. Faculty, students, and the accommodations office will work together regarding academic accommodations. Students are encouraged to discuss approved accommodations with your faculty.

3. **Basic Needs:** Please use the link to the Basic Needs Program on the Syllabus Policies and Assistance website for information on emergency food, housing accommodations, toiletries, and connections to critical resources.

4. **Syllabus Policies and Assistance Website:** CSUCI's Syllabus Policies and Assistance Website provides important details about academic policies, campus expectations, and student support services that are all highly applicable to your success as a student both in and outside of the classroom. Ensure that you review this site on a regular basis to stay informed about the policies and resources that support your success, as campus resources or policies may change semester to semester.

5. **Final Exam:** This course has a final exam as indicated in the grading section. The final exam will be held in accordance with the approved Final Exam schedule as indicated in the university exam schedule.

6. **Attendance Policy:** Attendance policy as specified in the Policy on Class Attendance (SP.01.056 or current version).

7. **Course Policies Subject to Change:** It is the student's responsibility to check the course's web page frequently to stay abreast of the course, and for corrections or updates to the syllabus. Any changes will be posted there.

This syllabus is written in accordance with CSUCI Senate Policy 24-07 – Syllabus Policy