The University of Texas at El Paso
Department of Computer Science
CS 3350 – Automata, Computability, and Formal Languages
Fall 2019 Syllabus

1. General Information

Instructor:
Daniel Mejia
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Office: CCSB 3.1020
Office Hours: Mondays & Wednesdays 1:30-3 pm, by appointment, and generally when door is open

Instructional Assistant (IA): TBA

Class Time:
Mondays and Wednesdays 12-1:20 pm, CCSB G.0208

Prerequisites:
- CS 2302 Data Structures and MATH 2300 Discrete Mathematics, both with grades C or higher, or
- CS 2401 Elementary Data Structures and Algorithms and MATH 2300, both with grades B or higher.

Textbook:
Introduction to the Theory of Computation, by Michael Sipser (2nd or 3rd edition).

This book is available at the bookstore and through major online book retailers. This textbook is required; bring to class every meeting. Photocopied textbooks are illegal, and their use will not be tolerated.

2. Objectives & Outcomes

Course Objectives:
Theoretical computing models and the formal languages they characterize: Finite state machines, regular expressions, pushdown automata, context-free grammars, Turing machines and computability; capabilities and limitations of each model, and applications including lexical analysis and parsing.

Major Topics Covered in the Course
- Regular languages, finite automata, non-deterministic FA
- Context-free languages, pushdown automata

- Parsing, normal forms, ambiguity
- Pumping lemmas and closure properties
- Turing machines and other equivalent models
- Decidable languages, non-decidable languages, recognizable languages, Chomsky hierarchy

Learning Outcomes

Level 1: Knowledge and Comprehension

Level 1 outcomes are those in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. The material has been presented only at a superficial level.

Upon successful completion of this course, students will:

a. Be familiar with the implications of Church-Turing thesis.
b. Understand that there are problems for which an algorithm exists, and problems for which there are no algorithms (non-recursive, non-recursively enumerable languages) and understand the implications of such results.
c. Understand and explain the diagonalization process as used in proofs about computability.
d. Understand the difference between feasible and non-feasible algorithms, understand the limitations of the current formalization of feasibility as polynomial-time.
e. Understand the main ideas behind the concepts of NP and NP-hardness, know examples of NP-hard problems.

Level 2: Application and Analysis

Level 2 outcomes are those in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details.

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

a. Convert a non-deterministic FA (respectively transition graph) into an equivalent deterministic FA, convert a transition graph or NFA into an equivalent regular expression, and convert a regular expression into an equivalent FA.
b. Construct a regular expression (respectively a context-free grammar) for a regular language (respectively context-free language).
c. Convert a context-free grammar into an equivalent pushdown automaton.
d. Construct a context-free grammar for a given context-free language.
e. Design an algorithm for a machine model to simulate another model.
f. Build simple Turing machines.
g. Prove formally properties of languages or computational models.
h. Apply a parsing algorithm.
i. Build a parse tree or a derivation from a context-free grammar.
j. Use the closure properties in arguments about languages.

Level 3: Synthesis and Evaluation

Level 3 outcomes are those in which the student can apply the material in new situations. This is the highest level of mastery.

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

a. Compare regular, context-free, recursive, and recursively enumerable languages.

b. Compare FA, PDA, and Turing machines.

3. Policies & Other Information

Grading:

- Exam 1 – 15%
- Exam 2 – 15%
- Exam 3 – 15%
- Homework – 10%
- Quizzes – 10%
- Attendance – 5%
- Final Exam – 30%

The nominal percentage-score-to-letter-grade conversion is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- below 60% is an F

The instructor reserves the right to adjust these criteria downward, e.g., so that 88% or higher represents an A, based on overall class performance. The criteria will not be adjusted upward, however.

Assignments:

Reading, non-programming homework, and programming lab assignments will be handed out, announced in class, or posted on Blackboard. If you miss a class, it is your responsibility to find out what you missed.

Typically, reading and non-programming homework assignments are due at the beginning of class on the assigned due-date, unless otherwise specified; a one-minute grace period will be given, after this a late penalty will be assessed (-10%). Unless for unusual circumstances and at the discretion of the instructor, non-programming homework assignments will not be accepted for credit after 10 minutes late. All reading and non-programming homework assignments must be handwritten in either pencil or black/blue pen, it will not be accepted otherwise. The assignment must be clearly legible for credit. Programming assignments (source code) will be submitted through Blackboard; accompanying lab report will be submitted with the source code and it is required to be typed.

Homework must be done individually. While you may discuss the problem in general terms with other people, your answers and your code should be written and tested by you alone. If you need help, consult a TA, IA, or the instructor.

Collaboration:

Collaboration among students is strongly encouraged.
It is acceptable to:

- Talk with other students about approaches and ideas.
- Get ideas and extra information from the internet, books, etc.

However, it is not acceptable to:

- Share code with another student (if a piece of code is submitted by two or more students, both students are guilty of cheating, regardless of who wrote the original code).
- Use code acquired from an outside source (the internet, a friend, etc.)
- Look at another student's code
- Debug another student's code

Software to detect plagiarized programs and appropriate disciplinary actions will be taken as necessary.

Exams:
There will be three (3) exams and one (1) final exam.
The purpose of the exams is to allow you to demonstrate mastery of course concepts. Make-up exams will be given only in extremely unusual circumstances. If you must miss an exam, please meet with the instructor before the exam if at all possible.

Quizzes:
The purpose of a quiz is to ensure that you have read the weekly reading assignment and to verify that you have mastered the major concepts of recent lectures. Quizzes typically will be about 5-10 minutes in length and will cover the material assigned to be read for the upcoming lecture plus selected concepts from previous lectures. There will be no make-up on missed quizzes.

Attendance:
Students are expected to be prepared and attend every class meeting on time. The nature of the course requires the students to attend the class meeting to be successful. The instructor reserves the right to not let a student enter the class after 5 minutes.

Technology:
The use of laptops, cell phones, tablets of any kind, may be necessary for in-class quizzes. Outside of the approved specified time (quizzes), laptops and cell phones should not be used during class. The use of laptops or tablets as a tool for taking notes will be considered on a case-by-case basis, at the sole discretion of the instructor. It is preferred that all notes should be taken using paper and pencil/pen.

All other electronics (and its accessories) including, but not limited to music playing devices and headphones are not allowed and should be stored prior to the beginning of class. The instructor reserves the right to ask individuals who do not comply to leave the class.

Disabilities:
If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or

visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

Important Dates:

September 2	Labor Day (University Closed – No Classes)
September 11	Fall Census Day
November 1	Fall Drop/Withdrawal Deadline
November 28-29	Thanksgiving (University Closed – No Classes)
December 5	Last day of Classes
December 6	Dead Day
December 9-13	Final Exams

4. Standards of Conduct and Academic Dishonesty

Standards of Conduct:
You are expected to conduct yourself in a professional and courteous manner, as prescribed by the UTEP Standards of Conduct.

A fundamental principle for any educational institution, academic integrity is highly valued and seriously regarded at The University of Texas at El Paso. More specifically, students are expected to maintain absolute integrity and a high standard of individual honor in scholastic work undertaken at the University. At a minimum, you should complete any assignments, exams, and other scholastic endeavors with the utmost honesty, which requires you to:

- Acknowledge the contributions of other sources to your scholastic efforts;
- Complete your assignments independently unless expressly authorized to seek or obtain assistance in preparing them;
- Follow instructions for assignments and exams, and observe the standards of your academic discipline; and
- Avoid engaging in any form of academic dishonesty on behalf of yourself or another student.

Graded work, e.g., homework and tests, is to be completed independently and should be unmistakably your own work (or, in the case of group work, your team's work), although you may discuss your project with other students in a general way. You may not represent as your own work material that is transcribed or copied from another person, book, or any other source, e.g., a web page.

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable to another person.

- **Cheating**
  - Copying from the test paper of another student
  - Communicating with another student during a test
  - Giving or seeking aid from another student during a test
  - Possession and/or use of unauthorized materials during tests (i.e. Crib notes, class notes, books, etc)
  - Substituting for another person to take a test
  - Falsifying research data, reports, academic work offered for credit
- **Plagiarism**
  - Using someone's work in your assignments without the proper citations
  - Submitting the same paper or assignment from a different course, without direct permission of instructors
- **Collusion**
  - Unauthorized collaboration with another person in preparing academic assignments

A full description of the University Standards of Conduct and Academic Dishonesty can be found in the Handbook of Operating Procedures.

Professors are required to -- and will -- report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students.