

Automata

CS3350 Spring 2015 – Syllabus

General information

Instructor:	Dr. Martine Ceberio
Lecture:	MW 10:30am – 11:50am, room CCSB 1.0202
Instructor's office:	CCS 3.0406
Office hours:	by appointment (see http://meetme.so/Ceberio) or just show up in my office
E-mail:	mceberio@utep.edu
Website and online forum:	piazza.com/utep/spring2015/cs3350/home
TA:	TBA
TA's Office hours:	TBA
Textbooks (required):	Introduction to the Theory of Computation, by Michael Sipser

Course description.

Theoretical computing models and the formal languages they characterize: finite state machines, regular expressions, push-down automata, context-free grammars, Turing machines. Capabilities and limitations of each model, as well as applications including lexical analysis and parsing. Computability.

Major topics covered in this course.

- Regular languages, finite automata, non-deterministic FA
- Context-free languages, push-down 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

Outcomes:

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

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 be able to:

- 1a. Be familiar with the implications of Church-Turing thesis.
- 1b. 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.
- 1c. Understand and explain the diagonalization process as used in proofs about computability.

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:

- 2a. Convert a non-deterministic FA (resp. transition graph) into an equivalent

- deterministic FA, to convert a transition graph or NFA into an equivalent regular expression, and to convert a regular expression into an equivalent
- 2b. Construct a regular expression (resp. a context-free grammar) for a regular language (resp. context-free language).
 - 2c. Convert a context-free grammar into an equivalent pushdown automaton.
 - 2d. Give a context-free grammar for a given regular language and be able to convert a right linear grammar into a transition graph.
 - 2e. Convert a multi-tape Turing machine into a Turing machine and a non-deterministic Turing machine into a deterministic Turing machine.
 - 2f. Build a Turing machine for a language and a Turing machine that performs a simple computation, e.g., adding two integers.
 - 2g. Use the pumping lemma for regular languages (resp. context-free languages) or closure properties for regular languages (resp. context-free languages) to show that a language is not regular (resp. not context-free).
 - 2h. Apply bottom-up and top-down parsing.

FA.

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:

- 3a. Compare regular, context-free, recursive, recursively enumerable languages.
- 3b. Assess the implications of Church-Turing-Markov's thesis.
- 3c. Determine 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.
- 3d. Evaluate the complexity class of a problem (P, NP, NP-complete, NP-Hard).
- 3e. Verify the diagonalization process to show that the Halting problem is not recursive and to show the existence of languages that are not recursively enumerable.
- 3f. Extend and apply results seen in class (for instance, "a language is recursive if and only if it is recursively enumerable and co-Turing recognizable").

What we will do in class.

"Lecture" sessions will be spent on:

** **Traditional lectures** that will usually last no more than half of the class period.*

** **Team work and discussions.***

If you miss a class session, it is your responsibility to find out what material you missed and to catch up with it before the next class session.

What will be graded.

- **Examinations.**

There will be two mid-term exams and one final exam. The final exam will be comprehensive. The mid-term exams will take place during the regular class session. The final exam will take place on the date specified by the university.

There will be **unannounced quizzes**. **No make-up** will be given for missed quizzes. At the end of the semester,

the weakest quiz grade will be dropped.

Extra-credit: There will be some extra credit offered during the semester (mostly as part of the exams and an extra project). There will be no extra credit given after week 12.

- **Assignments.**

There will be two kinds of assignments: homework assignments and one programming project. All assignments will be handed out or announced in class. ***If you miss a class session, it is your responsibility to find out what you missed: in particular, you will be expected to know if assignments were given and to turn them in on time.***

Graded work will be turned back to the students at the beginning of classes. If students are not in class at the time when their work is given back, it is their responsibility to ask for it at the end of the class or during office hours.

Homework assignments may consist in textbook readings (or other suggested reading) so as to prepare you for the coming week's lectures. You will also occasionally have to turn in your homework but this will be clearly indicated.

Note: For the homework assignments to be turned in, no late submission will be accepted unless arrangements have been made in advance or unusual circumstances warrant an exception.

Quizzes (announced or not) might be on anything covered since the start of the semester, including material you had to read and exercises you were asked to complete.

Each student will be working on a **programming assignment**. The project assignment will be given to students during week 3 of the semester and will be **due at the end of week 8.**

Late project submissions will be accepted to some extent: projects turned in late will be penalized **5%** for each day or partial day of lateness for up to five days, and **10%** for each day or partial day of lateness after that. After a week, projects will not be accepted unless other arrangements have been made in advance or unusual circumstances warrant an exception.

******* Failing to submit your project will result in failing the course. *******

In addition, the grade of each programming project will be as follows:

- * **50%** for your code (considering criteria such as: "does your code work?", "is it indented properly?", "commented properly?", "does your code fulfill all project requirements?")
- * **45%** for the report you will have to turn in along with your code (considering criteria such as: "does the report address all required questions?", "does it comply with the requested format?", "grammar and spelling", "is it articulate?")
- * **5%** that you will obtain by showing progress on your project during a meeting with the TA or instructor (as indicated in class) no later than two weeks prior to the deadline of your assignment. Note: if you fail to meet this requirement, your maximum grade will be 95%.

Work Rhythm:

You should expect to spend about 3-4 hours per week on the homework assignments / project, and another 2-3 hours per week working on reading assignments and textbook exercises (not assigned). Homework assignments, quizzes, and examinations will be handed back in class at the start of the session. ***If you are not in class at the time when these are handed out, it is your responsibility to ask for them at the end of the class session or during office hours.***

Policies.

- **Late work, late in class, and missed exams/quizzes.**

Any assignment turned in after the class in which it is due starts will be considered late. Quizzes (possibly unannounced) will often be given at the beginning of the class period. There will be no extra time for students who arrive late in class and no graded make-up quiz for missed quizzes. Major assignments will be penalized by one letter grade per day that they are turned in late (starting the first day after the class starts). There will be no exception to this rule.

Students who know in advance that they will miss an exam need to inform the instructor as soon as possible and make plans to take a make-up for the exam within a week after the actual date of the missed exam.

- **Class participation.**

Active participation is expected in this class. A total of 5% of your final grade are allocated to participation, which will be graded based on:

- Attendance
- General attitude, including arriving and leaving on time
- Your contribution to class discussions and exercises
- Completion of assigned homework on time
- Use of the instructor's office hours
- **Participate in the piazza conversations, ask questions, help your classmates online on piazza, etc.**

- **Attendance.**

Class attendance and participation is vital. Information will be shared in the class sessions that will help the students work on their projects and succeed in their exams. Excessive absences will have an adverse effect on a student's final grade. If you need to be absent, you need to inform your instructor, preferably before it happens. More than two absences will be considered excessive and might result in loss of some or all participation points. More than two unexcused absences will result in being dropped from the course.

- **General policies and conduct.**

- You are expected to be **on time**. Do not come to class late or leave early as this unfairly disrupts your classmates. Arriving late or leaving early will also have an adverse effect on your success in the class as you are likely to miss quizzes (for which no make-up will be provided), miss important information that you will be responsible to get back on your own. There will be no repetition of courses for students who arrive late or leave early.
- Students **arriving late to class will not be accepted** in class.
- You are expected to **spend the whole class period in class**: please attend the rest room or any other need before the class. Exceptions should be approved before the class period starts.
- You are expected to **do your class work and come prepared to class**. Homework and any assignments will be due at the beginning of the class period. Failing to turn in assignments on time will result in points off.
- You are expected to **check your UTEP emails** (or emails as listed on Goldmine) at least once a day.
- If you are going to be **absent** from class, it is **YOUR responsibility to catch up** with what was covered in class and with potential assignments given in class.
- If you are not on time in class and exams are turned back in, it is your responsibility to ask for your exams after the end of class or during office hours.
- It is your responsibility to **seek help for completing assignments**. If you need help, please contact your instructor or TA in a timely manner. Seeking assistance a few hours before the

- deadline is usually not met with success.
- Failing to follow submission guidelines for submitting assignments may result in either or all of the following: assignments being returned and lateness penalties being applied (if applicable), points off.
 - **Piazza: participation is required.** We will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com. Find our class page at: <https://piazza.com/utep/fall2014/cs3350/home>
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Grading.

- **Final grades will be based on the following:**

Mid-term examinations	20% each
Comprehensive final*	20%
Quizzes and homework	20%
Project	15%
Class participation	5%

- ***A grade of D or better is required at the final examination, regardless of the student's average: receiving an F at the final examination will result in failing the course.***
- ***Failing to turn in the project will result in failing the class.***

- **Determining grades.**

Grading scale for examinations and course work:

A	90% to 100%
B	80% to 90%
C	70% to 80%
D	60% to 70%
F	below 60%

Note: Make sure that you work in a timely manner on reading and programming assignments. Losing points by failing to submit, by not submitting on time, or by not meeting with your TA with project progress can result in receiving a lower letter grade on the course and/or failing the course.

Standards of Conduct.

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

Graded work, e.g., homework and tests, is to be completed independently (unless specified otherwise) 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. Professors are required to – and will – report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students.

Disabilities.

If you feel that you may have a disability that requires accommodation, contact the Center for Accommodations and Student Services Office (<http://sa.utep.edu/cass/>) at 747-5184, go to Room 106E Union, or

email cass@utep.edu.
