

CSCI4325 Fall 2016

Automata, Formal Languages and Computability Theory

Syllabus

Department of Computer Science

University of Texas Rio Grande Valley

Instructor

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Course Information

Credit hours: 3

Lecture times: MW 925-1040 AM, LHSB 1.402, East Campus.

WWW: <https://my.utrgv.edu/home>, login and click on the Blackboard Icon, and then click on the link for CSCI4325.02, Fall 2015.

Required textbook:

Michael Sipser. *Introduction to the Theory of Computation, 3e*. Thomson Course Technology, June 27, 2012. ISBN: 978-1133187790.

Course Description (Catalog)

The course presents formal computation models. Topics include finite state machine, pushdown state machine, Turing machine, halting problem, definition and properties of formal grammars and their languages as well as theory of computability and complexity including the complexity of optimization and approximation problems.

Prerequisites

You *must* have a C or higher CSCI 3333 or CMPE 3333 (Algorithms and Data Structures) and CSCI 3336 (Organization of Programming Languages). If you have not satisfied the prerequisites, then you *must* have the instructor's approval to take this course.

Course Objectives

After completing this course, you should be able to understand and answer the following questions:

- What is computation? This question is related to various computation models and their similarities.
- What can and cannot be computed? This question is about computability.
- What can and cannot be efficiently computed? This question is about computational complexity.
- How are language definition and computability intertwined? This question is about the equivalence of language definition and computational capability.

Student Learning Outcomes (SLOs)

- An ability to apply knowledge of computing and mathematics appropriate to the discipline
- An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
- An ability to use current techniques, skills, and tools necessary for computing practice

Course Organization

The class meets for lecture twice a week. Students must study the material assigned by the instructor and complete assignments. There will be weekly quizzes and two mid-term exams held in class (925am - 1040am) on **Thursday, Oct 10th**, and **Thursday, Nov 10th** of 2016, respectively. There is also a final exam at the end of the semester. All the quizzes and exams will be based on materials covered in lectures and assignments. Please do not plan to travel at the end of semester until the final exam is over.

Assignments

In this course you will need to understand many mathematical concepts and notations and learn to use them to write solutions and formal proofs. This can be achieved only through working at assignments. Therefore, it is very important for you to do the assignments seriously. Assignments will usually be assigned every week and due on Wednesday of the next week, but please see posted descriptions of assignments for actual due date. Most assignments will be exercises in the text book; they will be mainly for practice purpose and so will not be graded quantitatively; rather they will be put into one of the two categories: unsatisfactory (0) and satisfactory (1), where unsatisfactory assignments includes no or flimsy submissions and a satisfactory assignment must demonstrate serious effort in attempting all assignment problems. The instructor will keep a record of each student's number of satisfactory submitted assignments and consider that among other factors in determining how much/whether the student's overall course grades will be curved at the end of the semester. The instructor will try his best to correct your assignments but cannot guarantee that every assignment or every problem in any assignment will be reviewed due to time limit. However, solutions to all assignment problems will be given and discussed in class if needed. One exception to the handling of assignments as stated above is that instructor may occasionally assign extra-credit problems, which will be graded, and any extra credit earned through those problems will be incorporated into students' overall scores. However, if you do well in assignments, extra credit may be added to your overall scores for the course (see Grading section). To repeat, you must complete all assignments although they're not graded quantitatively, for otherwise you will not understand the material well and hence perform poorly on quizzes and exams. Typed

submissions are recommended, though not required. You must staple your submission if it is more than one page and write/type clearly your name, student ID number and due date on the first page. Late assignments will not be accepted except for documented and excusable cases dictated by UTRGV policies, which usually are only for family or medical emergencies. Late assignments will not be accepted regardless if the solution to those assignments has been made available to the class.

Quizzes

Quizzes will be held in class on the following dates:

Quiz #	1	2	3	4	5	6	7	8	9
Date	9/8/16	9/15/16	9/22/16	9/29/16	10/20/16	10/27/16	11/3/16	11/26/16	12/1/16

There are a total of nine quizzes. Each quiz takes 10 to 20 minutes. I will drop the two lowest grades and count the remaining seven.

Quizzes are not given automatically at either the beginning or at the end of a class period. It is your responsibility to be in class when a quiz is given. If you miss a quiz, that quiz becomes one of your two lowest quizzes (so no penalty ensues). However, should you miss three or more quizzes, these will count as zero. **No make-up quizzes will be given.** Do not request a make-up if you miss a quiz.

Attendance

Attendance is not required for this course. However, students' attendance of lectures will be taken and counted towards their overall score with a weight of 10%. Students have the option to be exempted from attending lectures, in which case they must notify the instructor no later than **Sep 12, 2016**. Students who opt to include their attendance scores in their overall grades for the course are allowed to have two absences without excuse or penalty.

Course Assessment and Grading

All course learning outcomes will be assessed through quizzes and exams, all of which will be graded to assess whether students have achieved expected learning outcomes. Final grades for this course will be based on your attendance, quizzes, exams, and extra credit obtained through assignments, if any. A breakdown of weights for each grading component is as follows.

Attendance 10%, Quizzes 30%, Exams 60% (20% for each exam), Assignments for Extra Credit.

I will NOT make changes in final grades unless the student can document an error on his grade records in a timely manner (See Regrading).

I will use the following number-to-letter grade mapping as dictated by UTRGV to assign final letter grades at the end of the course. I reserve the right to curve up (but not curve down) grades when and if I feel necessary.

100% >= A >= 90% > B >= 80% > C >= 70% > D >= 60% > F.

Regrading

If you have a question about the grading of any piece of work, you should consult with the instructor of the course within one week of the date that you received the grade. In other words, if you do not pick up your work in a timely fashion, you may forfeit your right to question the grading of your work.

Office Hours

Office hours offer you the opportunity to ask more individual questions about the course. Office hours are held on a first-come, first-served, drop-in basis. No appointment is necessary to attend regular office hours. Be aware that office hours become increasingly busy when it is close to an assignment deadline and/or quiz/exam date. Plan your use of office hours accordingly. Individual appointments may be arranged, if needed, as schedules allow.

Study Outside of Class

In this course, as in any course, you are expected to put in additional time beyond the scheduled class times. Professors generally expect that for each credit hour a class carries, a typical student will put in 2 – 3 hours of time each week outside of class. Since this is a 3-credit course, that translates into 6 – 9 hours of time outside of lecture times each week. During this time you should read the material before coming to class and then again in greater detail after each class. You should also attend office hours as needed and digest course materials thoroughly by doing homework.

Incompletes and Course Withdrawal

I will not give incomplete grades except for the rare cases dictated by University and Department policy. It is the student's responsibility, not the instructor's, to withdraw from the course in a timely manner if the student is doing poorly. No incomplete grades will be granted because of an incorrect withdrawal process. Please obtain due dates to withdraw from the course and also please read and be aware of the formal procedures to withdraw. This information is available in the course schedule and the student affairs office.

Online Blackboard

We will use UTRGV's online Blackboard (BB) as the place for making announcements and posting course materials/information such as assignments, grades, etc. To access UTRGV's BB, go to <https://my.utrgv.edu/home>, login and click on the Blackboard Icon. Please check Blackboard regularly and *at least once every 24 hours*. You can also post your questions there so that I, or even your fellow classmates, can answer them. It is YOUR responsibility to keep up-to-date with class developments through online Blackboard.

General Notes

If you don't understand something covered in class, ask about it right away. The only silly question is the one that is not asked. If you get a poor mark on an assignment or exam, find out why right away. Don't wait a month before asking. I will be happy to answer your questions. Don't be afraid to ask questions, or to approach the instructor in class, during office hours, in the hallways, or through e-mail.

The material in this course is hard as it requires quite a bit of mathematics. However, it can also be fun. Playing with proofs and formulas, you will have a chance to appreciate the beauty of mathematics in defining and studying computation models. You will also see those neat and elegant ideas in theory of computation, which are among the greatest ideas in computer science. We think theory of computation is interesting and fundamental to computer science, and we want to convince you of this. Work hard, but have fun!

UTRGV Policies

STUDENTS WITH DISABILITIES If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodations, please inform your instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodations can be provided at any time. Brownsville Campus: Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at accessibility@utrgv.edu. Edinburg Campus: Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at accessibility@utrgv.edu.

MANDATORY COURSE EVALUATION PERIOD Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (<http://my.utrgv.edu>); you will be contacted through email with further instructions. Online evaluations will be available Nov. 18 – Dec. 9, 2015. Students who complete their evaluations will have priority access to their grades.

SCHOLASTIC INTEGRITY As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism, and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE In accordance with UT System regulations, your instructor is a "responsible employee" for reporting purposes under Title IX regulations and so must report any instance, occurring during a student's time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal

disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect in an environment free from sexual misconduct and discrimination.

Tentative Course Calendar by Weeks:

Week Of	Lecture Topics	Quizzes and Exams
8/29/2016	Syllabus, Introduction	
9/5/2016	Finite Automata	Quiz 1 ¹
9/12/2016	Non-deterministic Finite Automata	Quiz 2
9/19/2016	Regular Expressions	Quiz 3
9/26/2016	Nonregular Languages	Quiz 4
10/3/2016	1 st Midterm Review	1 st Midterm Exam
10/10/2016	Context-free Grammars	
10/17/2016	Pushdown Automata	Quiz 5
10/24/15	Non-Context-Free Languages	Quiz 6
10/31/2016	Deterministic Context-Free Languages	Quiz 7
11/7/2016	2 nd Midterm Review	2 nd Midterm Exam
11/14/2016	Turing Machines	
11/21/2016	Non-deterministic Turing Machines	Quiz 8
11/28/2016	The (formal) Definition of Algorithms and Computability	Quiz 9
12/5/2016	Final Review	

Disclaimer

This syllabus does not contain all regulations that relate to students. Contents in the syllabus may be changed by the instructor with advanced notice and/or agreement with the students. Any change will be kept to a minimum.

¹ Each quiz usually covers topics discussed about in lectures during the week before the week the quiz takes place. The instructor will announce covered topics of each quiz ahead of time.