

CSCI4325.02 Spring 2020

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: TR 930m -1045am, LHSB 1.4502, Brownsville Campus.

WWW: <https://my.utrgv.edu/home>, login and click on the Blackboard Icon, and then click on the link for CSCI4325.02, Spring 2020.

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). 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 one mid-term exam held in class (930am - 1045am) on **Thursday, March 4th, 2020**. 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 Thursday of the next week, but please see posted descriptions of assignments for actual due dates. 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 pt) and satisfactory (1 pt), where unsatisfactory assignments include no or flimsy submissions and a satisfactory assignment must demonstrate serious effort in attempting all assignment problems. The points you received from homework assignments will count 10% towards your overall grade for the course. 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/or 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 quantitatively, and any extra credit earned through those problems will be incorporated into students' overall scores.

All your homework assignments will be submitted online in BB. Typed submissions are recommended but not required. You must submit scanned copies of your solutions to homework problems if they are handwritten on hard copies. You must write/type clearly your name, student ID number and due date on the first page. Every student is allowed to submit two late assignments. Additional late assignments are accepted only for documented and excusable cases dictated by UTRGV policies, which usually are for family or medical emergencies only. Late assignments will not be accepted regardless if the solution to those assignments has been made available to the class, or a majority of submissions for those assignments have been returned to students.

Quizzes

Quizzes will be held weekly online in BB, usually on Friday. Each quiz takes no more than 30 minutes. I will drop the two lowest quiz grades for each student. **No make-up quizzes will be given.**

Attendance

Students' attendance of lectures for this course will be taken and counted towards their overall scores 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 **Monday, January 20th, 2020**. 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, homework assignments, quizzes and exams. A breakdown of weights for each grading component is as follows.

Attendance 10%, Homework 10%, Quizzes 30%, Exams 50% (20% for midterm and 30% for final).

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% \geq A \geq 90% > B \geq 80% > C \geq 70% > D \geq 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!

Tentative Course Calendar by Weeks:

Week Of	Topics	Quizzes and Exams
1/13/2020	Introduction, review of mathematical notions and proofs	Quiz 1
1/20/2020	Finite Automata	Quiz 2
1/27/2020	Non-deterministic Finite Automata	Quiz 3
2/3/2020	Regular Expressions	Quiz 4
2/10/2020	Nonregular Languages	Quiz 5
2/17/2020	Context-free Grammars	Quiz 6
2/24/2020	Pushdown Automata	
3/2/2020	Midterm Review	Midterm Exam
3/9/2020	Spring break	
3/16/2020	Turing Machines	Quiz 7
3/23/2020	The (formal) Definition of Algorithms and Computability	Quiz 8
3/30/2020	Decidability	Quiz 9
4/6/2020	Undecidability	Quiz 10
4/13/2020	Computational complexity	Quiz 11
4/20/2020	P, NP and NP-complete/hard Languages	Quiz 12
4/27/2020	Final Review	
5/4/2020		Final Exam

UTRGV POLICY STATEMENTS

The UTRGV disability accommodation, mandatory course evaluation statement and sexual misconduct statement are required on all syllabi. Additional policy statements are optional, such as those covering attendance, academic integrity, and course drop policies.

STUDENTS WITH DISABILITIES: Required on all syllabi. Do not modify.

Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive academic accommodations should contact **Student Accessibility Services (SAS)** for additional information. In order for accommodation requests to be considered for approval, the student is responsible for providing sufficient documentation of the

disability to SAS and participating in an interactive discussion with SAS staff. Accommodations may be requested at any time but are not retroactive. Please contact SAS early in the semester/module for guidance. Students who experience a broken bone, severe injury, or undergo surgery may also be eligible for temporary accommodations.

Pregnancy, Pregnancy-related, and Parenting Accommodations

Title IX of the Education Amendments of 1972 prohibits sex discrimination, which includes discrimination based on pregnancy, marital status, or parental status. Students seeking accommodations related to pregnancy, pregnancy-related condition, or parenting (reasonably immediate postpartum period) are encouraged to contact Student Accessibility Services for additional information and to request accommodations.

Student Accessibility Services:

Brownsville Campus: Student Accessibility Services is located in 1.107 in the Music and Learning Center building (BMSLC) and can be contacted by phone at (956) 882-7374 or via email at ability@utrgv.edu.

Edinburg Campus: Student Accessibility Services is located in 108 University Center (EUCTR) and can be contacted by phone at (956) 665-7005 or via email at ability@utrgv.edu.

MANDATORY COURSE EVALUATION PERIOD: Required on all syllabi. Do not modify.

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. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available on or about:

Module 1	Feb 19-25, 2020
Module 2	April 15-21, 2020
Full Spring Semester	April 10-29, 2020

ATTENDANCE: Recommended on all syllabi; may be modified by the instructor as long as it is not inconsistent with UTRGV policy.

Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV's attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

SCHOLASTIC DISHONESTY: Recommended on all syllabi.

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 (including self-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, STU 02-100, and UTRGV Academic Integrity Guidelines). **All scholastic dishonesty incidents will be reported to Student Rights and Responsibilities.**

SEXUAL MISCONDUCT and MANDATORY REPORTING: Required on all syllabi. Do not modify.

In accordance with UT System regulations, your instructor is a “Responsible Employee” for reporting purposes under Title IX regulations and so must report to the Office of Institutional Equity & Diversity (oi@utrgv.edu) any instance, occurring during a student’s time in college, of sexual misconduct, which includes sexual assault, stalking, dating violence, domestic violence, and 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 that is free from sexual misconduct, discrimination, and all forms of violence. If students, faculty, or staff would like confidential assistance, or have questions, they can contact OVAVP (Office for Victim Advocacy & Violence Prevention) at (956) 665-8287, (956) 882-8282, or OVAVP@utrgv.edu.

COURSE DROPS: Recommended on all syllabi; may be modified by the instructor as long as it is not inconsistent with UTRGV policy.

According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

STUDENT SERVICES: Recommended on all syllabi.

Students who demonstrate financial need have a variety of options when it comes to paying for college costs, such as scholarships, grants, loans and work-study. Students should visit the Students Services Center (U Central) for additional information. U Central is located in BMAIN 1.100 (Brownsville) or ESSBL 1.145 (Edinburg) or can be reached by email (ucentral@utrgv.edu) or telephone: (888) 882-4026. In addition to financial aid, U Central can assist students with registration and admissions.

Students seeking academic help in their studies can use university resources in addition to an instructor’s office hours. University Resources include the Advising Center, Career Center, Counseling Center, Learning Center, and Writing Center. The centers provide services such as tutoring, writing help, counseling services, critical thinking, study skills, degree planning, and student employment. In addition, services such as the Food Pantry are also provided. Locations are listed below.

Center Name	Brownsville Campus	Edinburg Campus
Advising Center AcademicAdvising@utrgv.edu	BMAIN 1.400 (956) 665-7120	ESWKH 101 (956) 665-7120
Career Center CareerCenter@utrgv.edu	BCRTZ 129 (956) 882-5627	ESSBL 2.101 (956) 665-2243
Counseling Center Counseling@utrgv.edu Counseling and Related Services List	BSTUN 2.10 (956) 882-3897	EUCTR 109 (956) 665-2574
Food Pantry FoodPantry@utrgv.edu	BCAVL 101 & 102 (956) 882-7126	EUCTR 114 (956) 665-3663
Learning Center	BMSLC 2.118	ELCTR 100

LearningCenter@utrgv.edu	(956) 882-8208	(956) 665-2585
Writing Center WC@utrgv.edu	BUBLB 3.206 (956) 882-7065	ESTAC 3.119 (956) 665-2538

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.