UTRGV™

CSCI4325.02: Automata, Formal Languages and Computability Theory
SYLLABUS
Spring 2022
Subject to any new Texas legislative mandate changes.

COURSE INFORMATION:
Meeting times: TR, 930am – 1045am
Meeting location: BRHB 1.222, Brownsville Campus

Course Modality: Traditional Face-to-Face

INSTRUCTOR INFORMATION:
Instructor Name: Liyu Zhang
Phone: (956) 882-6631
E-Mail: liyu.zhang@utrgv.edu
Office hours: MW 10 - 12, TR 1130 - 1230 and by appointment
Office location: SETB 1.522, Brownsville Campus

COURSE DESCRIPTION, PREREQUISITES & MODE OF LEARNING

Course Description (Catalog) The course presents formal computation models. Topics include finite state machines, pushdown state machines, Turing machines, the halting problem, definitions 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 grade for 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.

Mode of Learning As stated in the previous section, this course will be delivered in the traditional face-to-face way.

COVID-19 RESOURCES:
Please visit the UTRGV COVID-19 protocols web page for the most up-to-date COVID-19 campus information and resources. The COVID-19 Frequently Asked Questions (FAQs) web page offers additional guidance to specific questions. To submit a question for the FAQ, please email WelcomeBack@utrgv.edu.

UTRGV VACCINE PORTAL
UTRGV Students are eligible to receive the COVID-19 Vaccine. Students may access and complete their vaccine profile via the UTRGV Vaccine Portal. For additional information on the COVID-19 Vaccine, please visit the UTRGV Vaccine web page.

LEARNING OBJECTIVES/OUTCOMES FOR THE COURSE

Program Student Learning Outcomes	Student Learning Outcomes (After completing this course, student should be able to understand and answer the following questions)	Major Course Requirement/Major Assignment/Examination
(1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.	• 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	Quizzes and Exams
(2) An ability to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.	• What can and cannot be computed? This question is about computability. • What can and cannot be efficiently computed? This question is about computational complexity.	Quizzes and Exams
(6) An ability to apply computer science theory and software development fundamentals to produce computing-based solutions.	• 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	Quizzes and Exams

The following textbook is required for this course:

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

Currently, the book can be purchased from Amazon at $76.94 for a new paperback copy and $59.99 for a used copy.

To succeed in this course, you need to be able to participate in class sessions and activities. This will require:

- Reliable internet for class meeting times
- A webcam (not the one embedded in your computer) and a private place to take exams
- A place to work and a reliable computer (laptop or desktop)
    - A tablet would be very difficult for this class, and insufficient for the major
    - Any standard computer will work. The most important considerations to compare against cost are:
        - Reliability, warranty, repair options
        - Portability, size, battery life
            - Desktops are more powerful and cheaper, but portability is a high value for most students. We have good open CS labs on campus, but that is not the same as having your own machine with you anywhere.
        - Windows is most common, and thus best supported. macOS and linux work, but you will need to have the IT knowledge and skills to adapt things (not in this class).
        - Specs:
            - Minimum: 8 GB RAM, i5 processor, 256 GB storage
            - Recommended: 16 GB RAM, i7 processor, 512 GB storage
            - SSD is very nice, but is also an easier cut to reduce cost
            - 2-in-1, touchscreen, pen digitizer are all great, but they are luxuries
            - You pay a premium for a mac or a surface, you can get equivalent hardware for a lot less
            - Big GPU power only matters if you are gaming or doing heavy 3d work. A secondary desktop later on may be a better investment.
        - Packages and deals are available at the UTRGV bookstore (https://link.utrgv.edu/campusstores-tech/).
- **Daily access to online Blackboard** We will use UTRGV online Blackboard as the place for making announcements and posting course materials/information such as course calendar, lecture notes, assignments and grades etc. So please check Blackboard regularly and at least once every 24 hours. It is YOUR responsibility to keep updated with class through online Blackboard.

GRADING POLICIES

Attendance	10%
Homework	10%
Quizzes	30%
Exams (Midterm and Final)	50%

Grading scale: 100% >= A >= 90% > B >= 80% > C >= 70% > D >= 60% > F

Re-grading 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 the work was returned. 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.

EXAMS, QUIZZES AND ASSIGNMENTS

Exams There is one mid-term exam during the semester, which will be held in regular lecture time on **Thursday, March 10th, 2022**. There is also a final exam at the end of the semester at the time and location as scheduled by UTRGV. Both 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 grades.

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 Thursday. 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 are expected to attend all scheduled Collaborate sessions for lectures 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; have been provided such an accommodation by Student Accessibility Services (SAS); 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.

Attendance of lectures is taken when you join and stay through the whole duration of the Collaborate Ultra sessions for lectures. Alternatively, you can also watch the session recordings by the end of the same week (1159pm, Saturday) the recordings are available. Attendance counts towards your final grade for this course by default. No excuse other than officially documented cases allowable by the university policies, which are usually only for family or extreme health emergencies, will be accepted for absences. You are not required to attend class on days listed in the university calendar as major religious holy days (although I assume that you practice at most one religion). In addition, you're allowed two absences without excuses or grade penalties. Students have the option to be exempted from attendance of lectures, in which case the percentage weight of attendance will be distributed proportionally among other grading components. To activate this option, however, students must notify the instructor no later than **Friday, January 28th, 2022.**

Use of Classroom Recordings

The use of classroom recordings is governed by the Federal Educational Rights and Privacy Act (FERPA), UTRGV's acceptable-use policy, and UTRGV HOP Policy STU 02-100 Student Conduct and Discipline. A recording of class sessions will be kept and stored by UTRGV, in accordance with FERPA and UTRGV policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. **You may not share recordings outside of this course.** Doing so may result in disciplinary action under UTRGV HOP Policy STU 02-100 Student Conduct and Discipline.

MAKEUP POLICIES
I generally don't give makeup assignments, quizzes or exams, except officially documented cases allowable by the university policies, which are usually only for family or extreme health emergencies. If you need a makeup work you must notify me ahead of time, or as soon as reasonably possible.

BLACKBOARD SUPPORT
If you need assistance with course technology at any time, please contact the Center for Online Learning and Teaching Technology (COLTT).

Campus:	Brownsville	Edinburg
Location:	Casa Bella (BCASA) 613	Education Complex (EEDUC) 2.202
Phone:	956-882-6792	956-665-5327

Toll Free: 1-866-654-4555

Office Hours: Monday - Friday, 7:30 a.m. - 6:00 p.m.
Support Tickets Submit a Support Case via our Ask COLTT Portal

24/7 Blackboard Support
Need Blackboard assistance after hours? You can call our main office numbers, 956-882-6792 or 956-665-5327, to speak with a support representative.

ACADEMIC INTEGRITY:

Members of the UTRGV community uphold the Vaquero Honor Code's shared values of honesty, integrity and mutual respect in our interactions and relationships. In this regard, academic integrity is fundamental in our actions, as any act of dishonesty conflicts as much with academic achievement as with the values of honesty and integrity. Violations of academic integrity include, but are 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 (Board of Regents Rules and Regulations, STU 02-100, and UTRGV Academic Integrity Guidelines). **All violations of Academic Integrity will be reported to Student Rights and Responsibilities through Vaqueros Report It.**

Specifically for this course, a grade of 0 will be given to the cheated work if a cheating is caught for the first time for the involved student, and an F grade will be given for the whole course to any student who is caught for cheating for the second time. In the latter case the incident will be forwarded to the department chair and beyond if necessary.

Incompletes and Course Withdrawal I will not give incomplete grades except for the rare cases dictated by the University and Department policy. It is the student's responsibility, not the instructor's, to withdraw from the course in a timely manner if doing poorly. No incomplete grades will be granted because of a wrong 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.

UTRGV POLICY STATEMENTS

STUDENTS WITH DISABILITIES:

Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive reasonable academic accommodations should contact **Student Accessibility Services (SAS)** for additional information. In order for accommodation requests to be considered for approval, the student must apply using the *mySAS* portal. and is responsible for providing sufficient documentation of the disability to SAS. Students are required to participate in an interactive discussion, or an intake appointment, with SAS staff. Accommodations may be requested at any time but are not retroactive, meaning they are valid once approved by SAS. 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) should submit the request using the form found at https://www.utrgv.edu/pregnancyandparenting for review by **Student Accessibility Services.**

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 encouraged 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:

Spring Module 1 (7 weeks)	February 23 – March 1, 2022
Spring Regular Term 2022	April 15 – May 4, 2022
SpringModule 2 (7 weeks)	April 20 – 26, 2022

SEXUAL MISCONDUCT and MANDATORY REPORTING:
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 (OIED@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:
According to UTRGV policy, students may drop any class without penalty earning a grade of DR (drop) 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:
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 Student 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: (956) 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	EITTB 1.000 (956) 665-7120
Career Center CareerCenter@utrgv.edu	BINAB 1.105 (956) 882-5627	ESTAC 2.101 (956) 665-2243
Counseling Center Counseling@utrgv.edu Mental Health 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 LearningCenter@utrgv.edu	BMSLC 2.118 (956) 882-8208	ELCTR 100 (956) 665-2585
Writing Center WC@utrgv.edu	BLIBR 3.206 (956) 882-7065	ESTAC 3.119 (956) 665-2538

CALENDAR OF ACTIVITIES:
Include in this section a table or list that provides a general description of the subject matter of each lecture or discussion.

Week of	Lecture Topics	Quizzes and Exams
1/17/2022	Syllabus, Introduction	
1/24/2022	Finite Automata	Quiz 1
1/31/2022	Non-deterministic Finite Automata	Quiz 2
2/7/2022	Regular Expressions	Quiz 3
2/14/2022	Nonregular Languages	Quiz 4
2/21/2022	Context-free Grammars	Quiz 5
2/28/2022	Pushdown Automata	Quiz 6
3/7/2022	TBA	TBA
3/14/2022	Midterm Review	Midterm Exam
3/21/2022	Turing Machines and The (formal) Definition of Algorithms and Computability	Quiz 7
3/28/2022	Decidability	Quiz 8

4/4/2022	Undecidability	Quiz 9
4/11/2022	Computational complexity	Quiz 10
4/18/2022	P, NP and NP-complete/hard Languages	Quiz 11
4/25/2022	TBA	TBA
5/2/2022	Final Review	Final Exam

Be sure to include important dates relative to the academic calendar. The UTRGV academic calendar *can be found on* My.UTRGV at the bottom of the screen prior to login. *Some important dates for Spring 2022 include:*

Spring Module 1
January 12	*First day of classes.*
January 12	*Last day to add a class or register for Spring 2022 Module 1 classes.*
February 22	*Last day to drop a class or withdraw.*
March 2	*Final Exams (Term Ends)*
March 4	*Grades Due at 3 p.m.*

Spring Regular Term
January 18	*First day of classes.*
January 23	*Last day to add a class or register for Spring 2022 classes.*
March 14-19	*Spring Break. No classes.*
April 11	*Last day to drop a class or withdraw.*
April 15-16	*Easter Holiday. No classes.*
May 5	*Study Day – NO classes*
May 6-12	*Final Exams*
May 16	*Grades Due at 3 p.m.*

Spring Module 2
March 9	*First day of classes.*
March 9	*Last day to add a class or register for Spring 2022 Module 2 classes.*
April 19	*Last day to drop a class or withdraw.*
April 27	*Final Exams (Term Ends)*
April 29	*Grades Due at 3 p.m.*

DEAN OF STUDENTS RESOURCES:
The Dean of Students office assists students when they experience a challenge with an administrative process, unexpected situation such as an illness, accident, or family situation, and aids in resolving complaints. Additionally, the office facilitates student academic related requests for religious accommodations, support students formerly in foster care, helps to advocate on behalf of students and inform them about their rights and responsibilities, and serves as a resource and support for faculty and campus departments.

Vaqueros Report It allows students, staff and faculty a way to report concern about the well-being of a student, seek assistance in resolving a complaint, or report allegations of behaviors contrary to community standards or campus policies.

The Dean of Students can be reached by emailing dos@utrgv.edu, by logging into Virtual Office hours in which a representative is available Monday-Friday 9:00-11:00 a.m. and 1:00-4:00 p.m, or by visiting one of the following office locations: Cavalry (BCAVL) 204 or University Center (EUCTR 323). Phone: 956-665-2260.

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.