



**CSCI4325.02: Automata, Formal Languages and Computability Theory  
SYLLABUS  
Spring 2024**

*Subject to any new Texas legislative mandate changes.*

**COURSE INFORMATION:**

Meeting times: TR, 930am – 1045am  
Meeting location: BINAB 1.208, Brownsville Campus

**Course Modality:** Traditional Face-to-Face

**INSTRUCTOR INFORMATION**

Instructor Name: Liyu Zhang  
UTRGV E-mail: liyu.zhang@utrgv.edu  
Office Phone: (956) 882-6631  
Office Location: BSETB 1.522 and online through Zoom meeting: 863 4976 1271  
Office Hours: TR 2pm – 430pm

**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.

**LEARNING OBJECTIVES/OUTCOMES FOR THE COURSE**

<b>Program Student Learning Outcomes</b>	<b>Student Learning Outcomes</b> (After completing this course, student should be able to understand and answer the following questions)	<b>Major Course Requirement/Major Assignment/Examination</b>
(1) Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.	<ul style="list-style-type: none"> <li>• What is computation? This question is related to various computation models and their similarities.</li> <li>• What can and cannot be computed? This question is about computability.</li> <li>• What can and cannot be efficiently computed? This question is about computational complexity.</li> <li>• How are language definition and computability intertwined? This</li> </ul>	Quizzes and Exams

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	question is about the equivalence of language	
(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.	<ul style="list-style-type: none"> <li>• What can and cannot be computed? This question is about computability.</li> <li>• What can and cannot be efficiently computed? This question is about computational complexity.</li> </ul>	Quizzes and Exams
(6) An ability to apply computer science theory and software development fundamentals to produce computing-based solutions.	<ul style="list-style-type: none"> <li>• What can and cannot be computed? This question is about computability.</li> <li>• What can and cannot be efficiently computed? This question is about computational complexity.</li> <li>• How are language definition and computability intertwined? This question is about the equivalence of language</li> </ul>	Quizzes and Exams

## ASSESSMENT OF LEARNING

As mentioned in the last section, all SLOs will be assessed through quizzes and exams. The grading scheme for your overall course grades is described below.

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.

## REQUIRED READINGS, TECHNOLOGY NEEDS, AND RESOURCE MATERIALS

The following textbook is required for this course:

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

Currently, the book can be purchased from Amazon at \$105.07 for a new hard-cover copy or \$48.30 for a used copy.

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

- A working computer with reliable internet access and equipment such as a scanner and a camera to get images of your quiz and homework solutions and upload them to the Blackboard.
- **Daily access to online Blackboard.** We will use UTRGV's Blackboard website as the venue 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 Blackboard.

## TENTATIVE CALENDAR OF ACTIVITIES

Week of	Lecture Topics	Quizzes and Exams
1/15/2024	Syllabus, Introduction, and Background Review	
1/22/2024	Finite Automata	Quiz 1
1/29/2024	Non-deterministic Finite Automata	Quiz 2
2/5/2024	Regular Expressions	Quiz 3
2/12/2024	Nonregular Languages	Quiz 4
2/19/2024	Context-free Grammars	Quiz 5
2/26/2024	Pushdown Automata	Quiz 6
3/4/2024	Midterm Review	Midterm Exam
3/11/2024	Spring Break	
3/21/2024	Turing Machines and the (formal) Definition of Algorithms and Computability	Quiz 7
3/28/2024	Decidability	Quiz 8
4/4/2024	Undecidability	Quiz 9
4/11/2024	Computational complexity	Quiz 10
4/18/2024	P, NP and NP-complete/hard Languages	Quiz 11
4/25/2024	TBA	TBA
5/2/2024	Final Review	Final Exam

## COURSE POLICIES AND PROCEDURES

*We value a positive and supportive learning environment, and for us to thrive together, we must recognize that our responsibilities, actions, and contributions can impact and transform our learning. The course policies listed below are created to ensure your success by fulfilling course expectations while remaining flexible to account for unexpected events.*

### Learning and Teaching Environment

We expect all of you to attend all lectures in person, complete all homework and quizzes, and take the exams. You are also welcome to ask questions during lectures and office hours.

### Attendance and Absences/Sick Policy

Students are expected to attend all scheduled classes. [UTRGV's attendance policy](#) excuses students from attending class if they are participating in officially sponsored university activities, such as athletics, accommodation by Student Accessibility Services (SAS), observance of religious holy days, or military service. Accommodation related to long-term complications from medical conditions should go through SAS. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

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, February 9<sup>th</sup>, 2024**.

### **Use of Lecture Recordings**

The instructor intends to record all lectures of this course and made them available to you for review purpose. The use of lecture 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.** As referenced in [UTRGV HOP Policy STU 02-100 Student Conduct and Discipline](#), doing so may result in disciplinary action.

### **Exams, Quizzes and Homework**

Exams There is one mid-term exam during the semester, which will be held in regular lecture time on **Thursday, March 10<sup>th</sup>, 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.

Homework 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 homework assignments. Therefore, it is very important for you to do the homework 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 homework 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 homework assignments include no or flimsy submissions and a satisfactory assignment must demonstrate serious effort in attempting all homework 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 homework problems will be given and/or discussed in class if needed. One exception to the handling of homework 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 graded and 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.**

### **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 makeup work you must notify me ahead of time, or as soon as reasonably possible.

## COURSE DROPS

Instructor-initiated drops can have significant financial consequences for students. 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 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.

## 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. The Writing Center is an excellent resource to assist in learning about and avoiding plagiarism in writing. 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 involved students, 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.

## STUDENT SUPPORT RESOURCES

[The following student support resources are required on course syllabi. DO NOT Modify]

*We are committed to your personal, academic, and professional success; please know you can reach out to me for questions and/or I can help you identify the resources you need. UTRGV offers student support resources designed to contribute to your well-being and academic excellence.*

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. These centers provide services such as tutoring, writing help, counseling services, critical thinking, study skills, degree planning, and connections student employment (through [Handshake](#) and [HR Student Employment](#)). In addition, services, such as the Food Pantry are also provided. Locations are listed below.

Center Name	E-mail	Brownsville Campus	Edinburg Campus
Advising Center	<a href="mailto:AcademicAdvising@utrgv.edu">AcademicAdvising@utrgv.edu</a>	BMAIN 1.400 (956) 665-7120	EITTB 1.000 (956) 665-7120
Career Center	<a href="mailto:CareerCenter@utrgv.edu">CareerCenter@utrgv.edu</a>	BINAB 1.105 (956) 882-5627	ESTAC 2.101 (956) 665-2243
Counseling Center	<a href="mailto:Counseling@utrgv.edu">Counseling@utrgv.edu</a> <a href="#">Mental Health Counseling and Related Services List</a>	BSTUN 2.10 (956) 882-3897	EUCTR 109 (956) 665-2574
Food Pantry	<a href="mailto:FoodPantry@utrgv.edu">FoodPantry@utrgv.edu</a>	BCAVL 101 & 102 (956) 882-7126	EUCTR 114 (956) 665-3663

Center Name	E-mail	Brownsville Campus	Edinburg Campus
Learning Center	<a href="mailto:LearningCenter@utrgv.edu">LearningCenter@utrgv.edu</a>	BMSLC 2.118 (956) 882-8208	ELCTR 100 (956) 665-2585
University Library	<a href="mailto:circulation@utrgv.edu">circulation@utrgv.edu</a> <a href="http://www.utrgv.edu/library">www.utrgv.edu/library</a>	BLIBR (956) 882-8221	ELIBR (956) 665-2005
Writing Center	<a href="mailto:WC@utrgv.edu">WC@utrgv.edu</a>	BLIBR 3.206 (956) 882-7065	ESTAC 3.119 (956) 665-2538

### Financial Need

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](mailto:ucentral@utrgv.edu)) or telephone: (956) 882-4026. In addition to financial aid, U Central can assist students with registration and admissions.

### 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	Marialice Shary Shivers (EMASS) 3.142
Phone	(956)-882-6792	(956)-665-5327
Toll Free	1-(866)-654-4555	
Support Tickets	Submit a Support Case via our <a href="#">Ask COLTT Portal</a>	
Online Support	<a href="#">Chat with a Support Specialist online.</a>	
24/7 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.	

## UNIVERSITY POLICY STATEMENTS

[The following UTRGV policy statements are required on all syllabi. DO NOT Modify.]

*We care about creating a safe and supportive learning environment for all students. The University policy statements below are intended to create transparency for your rights and responsibilities as students. We each contribute to ensuring a safe and positive environment through our actions and conduct, and students are encouraged to advocate for their needs.*

### STUDENT ACCESSIBILITY SERVICES

Student Accessibility Services staff can be contacted at either campus to learn about and explore accessibility services.

Campus:	Brownsville	Edinburg
Location:	Music and Learning Center (BMSLC, 1.107)	University Center (EUCTR, 108)
Phone:	phone (956) 882-7374	phone (956) 665-7005
e-mail	<a href="mailto:ability@utrgv.edu">ability@utrgv.edu</a>	

### 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 ACCOMODATIONS

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 should submit the request using the form found at [Pregnancy and Parenting | UTRGV](#).

For questions about campus support services or public benefit programs for students who are pregnant, or parenting contact the Parenting Liaison officer in the Dean of Students Office.

Edinburg: UCTR rm. 325

Phone: 956.665.2260

Brownsville: BCAVL rm. 209

Email: [dos@utrgv.edu](mailto:dos@utrgv.edu)

### 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](mailto: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](http://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 OAVP (Office for Advocacy & Violence Prevention) at (956) 665-8287, (956) 882-8282, or [OAVP@utrgv.edu](mailto:OAVP@utrgv.edu).

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## DEAN OF STUDENTS

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.

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**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 email ([DOS@UTRGV.EDU](mailto:DOS@UTRGV.EDU)), phone (956-665-2260), (956-882-5141), or by visiting one of the following office locations: Cavalry (BCAVL) 204 or University Center (EUCTR 323).

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## MANDATORY COURSE EVALUATION PERIOD

Students have the opportunity to complete an ONLINE evaluation of this course, accessed through your UTRGV account (<http://my.utrgv.edu>). Course evaluations are used by the instructor to better understand the student experience in the course, which can inform revisions of the course to ensure student success. Additionally, course evaluations are also used by the instructor for annual performance review and promotion applications, teaching award applications, among others. For these reasons, your feedback, reflections, and insights on your experience in the course are invaluable to ensure student success and a quality education for all. 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 21 – 27, 2024
Spring Regular Term 2024	April 10 – May 1, 2024
Spring Module 2 (7 weeks)	April 17 – 23, 2024

**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.