Texas Tech University
Department of Computer Science

Course Name: Theory of Automata   **Number:** CS-3383
Semester: Spring 2025

Instructor Name: Ziwen Pan   **Office:** 306A   **E-mail:** ziwen.pan@ttu.edu
Instructor's Office Hour:
1 – 2PM on Mondays and Fridays

TA: Sonali Singh
Email: sonalsin@ttu.edu

Lectures: 3:00 – 3:50 PM on Mondays, Wednesdays and Fridays in ECE217

Catalog Listing: The relationship between language, grammar, and automata. Deterministic and nondeterministic machines. Pushdown automata and Turing machines.

Textbook: (optional) "Elements of Theory of Computation", 2ed, by Lewis and Papadimitriou

Course objectives:

The objective of this course is to learn classes of abstract machines and grammars.

Key Topics:

Closures and algorithms. Languages and representation of languages. Deterministic and non-deterministic automata. Regular expressions. Languages that are and are not regular. Context-free grammar. Parse trees. Pushdown automata. Languages that are and are not context-free. Turing machines. Computation with Turing machines.

Course Prerequisites: CS 1382 Discrete Computational Structures

Expected Prior Knowledge and Skills In: programing and algorithm design experience

Learning Outcomes: Students who have completed this course should be

1. Familiar with formal methods, such as abstract machines and formal grammars, for defining infinite sets of strings by finite means.
2. Able to classify these methods according to their expressive power.
Assessment methods of all of the above: exams and assignments

Grading Policy:
There will be around seven sets of homework that consist of 50% of the total grades. The number of homework assignments may slightly change depending on the course schedule. The due dates of each homework set will be announced during class. No due dates extension may be granted, and late submissions may not be considered.

Tentative schedule, subject to change.

Students need to participate in all three exams in person on campus. All tests will count towards the final grade, that is, no exams may be dropped/missed. Cheating on tests and assignments will not be tolerated. Any student caught cheating on an exam or assignment will receive a grade of 'F' for the course and will be reported to the Judicial Programs office.

Grading distribution:
Test 1: 10% (During class on Monday, February 17th, 2025)
Test 2: 15% (During class on Monday, March 31st, 2025)
Final exam: 20% (4:30 – 7:00 PM on Saturday, May 10th, 2025)
Homework sets: 50% (due dates to be available)
Attendance: 5% (Attendance may be taken at selected classes)

Note that:
Tests 1 and 2 dates are tentative and may be subject to change.
All three exams will be held in our lecture hall.
All exams are closed-book, closed-notes, with no 'cheat sheet' allowed.
Course Grading:
A 90-100%
B 80-89%
C 70-79%
D 60-69%
F 0-59%

Course Schedule (Weekly)
Last day of class: Monday, May 05
Holidays:
MLK Day: Jan 20
Spring Vacation: March 15 – 23
No Classes: April 21

The following topics will be discussed:

1. Sets, relations and functions
2. Deterministic Finite Automata (DFA)
3. Non-deterministic Finite Automata (NFA)
4. NFA DFA equivalence
5. Closure under regular operation
6. Regular expression
7. NFA = regular
8. Non-regular languages
9. Context-Free Grammars (CFG)
10. Parse tree
11. Pushdown automata
*12. Turing Machine

Topics and/or dates may be changed during the semester at the instructor's discretion because of scheduling issues, developments in the discipline, or other contingencies.

Tentative schedule, subject to change.

Ethical Conduct:

Students are expected to comply with the Texas Tech Code of Student Conduct in all aspects of this class. The Code of Student Conduct may be found from the Student Handbook and/or Office of Student Conduct (https://www.depts.ttu.edu/dos/Studenthandbook2022forward/Student-Handbook-2023-2024.pdf).

In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction, such as working on other classes, taking cell phone calls, text messaging, and working on laptop computers. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class.

Violations of conduct including academic dishonesty, foul language, and classroom citizenship are eligible to be reported to Student Conduct Office.

Students with Disabilities (ADA Statement):

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in Weeks Hall or call 806-742-2405.

Academic Integrity:

Academic integrity is taking responsibility for one's own class and/or course work, being individually accountable, and demonstrating intellectual honesty and ethical behavior. Academic integrity is a personal choice to abide by the standards of intellectual honesty and responsibility. Because education is a shared effort to achieve learning through the exchange of ideas, students, faculty, and staff have the collective responsibility to build mutual trust and respect. Ethical behavior and independent thought are essential for the highest level of academic achievement, which then must be measured. Academic achievement includes scholarship, teaching, and learning, all of which are shared endeavors. Grades are a device used to quantify the successful accumulation of knowledge through learning. Adhering to the standards of academic integrity ensures grades are earned honestly. Academic integrity is the foundation upon which students, faculty, and staff build their educational and professional careers.

Although students are encouraged to discuss ideas and problems with the instructor, assistant, and other students, academic dishonesty will not be tolerated. Unless stated otherwise by the instructor, you are not allowed to share code or answers, use or even look at code or answers obtained from online sources, friends, or classmates. Posting, publishing, or otherwise sharing questions or answers to exams, quizzes, tests, finals, or other assignments, without the explicit permission of the instructor is a serious violation of the code of conduct and will result in serious repercussions.

It is your responsibility to educate yourself about actions that constitute academic dishonesty. If you are not sure whether a specific action is allowed, talk to the instructor. All submitted code and assignments will be randomly checked for plagiarism. Students may be asked to explain their work submitted. Academic dishonesty of any kind, if discovered, will result in one or more of the following sanctions: a grade of 0 for

Tentative schedule, subject to change.

the corresponding graded item, a grade of "F" in the course, and further action according to the TTU operating procedures: http://www.depts.ttu.edu/opmanual/OP34.12.pdf.

Religious Holy Day Observation:

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Illness-related Absences:

Illness-related absences will require proper documentation to be considered excused. Students should communicate with the instructor regarding adjusting course deadlines due to illness.

Absence Due to Officially Approved Trips:

Students missing classes due to an approved trip should notify the instructor of the departure and return schedule to seek in-advance approval before the trip.

Accommodation for Pregnant Students:

To support the academic success of pregnant and parenting students and students with pregnancy related conditions, the University offers reasonable modifications based on the student's particular needs. Any student who is pregnant or parenting a child up to age 18 or has conditions related to pregnancy may contact Alex Faris, the Texas Tech University designated Pregnancy and Parenting Liaison, to discuss support available through the University. The Liaison can be reached by emailing alfaris@ttu.edu. Should a student communicate with the instructor that they are pregnant or have a pregnancy related condition or may need additional resources related to pregnancy or parenting, the instructor will communicate that student's information to the Title IX Coordinator, who will work with the student and others, as needed, to ensure equal access to the University's education program or activity.

For more information regarding supportive measures, please contact pregnancy & parenting liaison Alex Faris (alfaris@ttu.edu, 806.834.3420) or visit https://www.depts.ttu.edu/titleix/PregnacnyandParenting/index.php. You can also visit https://www.depts.ttu.edu/titleix/PregnacnyandParenting/index.php to submit a request to Alex Faris for assistance.

AI Use Policy:
AI USE IS PROHIBITED IN THIS COURSE:
https://www.depts.ttu.edu/tlpdc/AI_Resources/AI-Use-is-Prohibited.pdf
The use of generative AI tools (such as ChatGPT) is strictly prohibited in this course for any purpose. Information gathered from AI cannot be used even with appropriate citation. Submission of AI-generated

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content (i.e., information, text, or images) as your own work is a violation of academic integrity and may result in referral to the Office of Student Conduct. Please contact your instructor if you have questions regarding this course policy.

Classroom Civility:

Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student–student and student–faculty interactions in and out of the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the university (https://www.depts.ttu.edu/dos/Studenthandbook2022forward/Student-Handbook-2023-2024.pdf). If you exhibit distractive or inappropriate behavior (without explicit consent of the instructor), you may be asked to leave the class session and be subject to attendance-related penalties.

Discrimination, Harassment and Sexual Violence:

Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806- 742-3674, https://www.depts.ttu.edu/scc/(Provides confidential support on campus.) TTU 24-hour Crisis Helpline, 806-742-5555, (Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.) Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, voiceofhopelubbock.org (24-hour hotline that provides support for survivors of sexual violence.) The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, https://www.depts.ttu.edu/rise/ (Provides a range of resources and support options focused on prevention education and student wellness.)

Late Arrival, Late Return, and Early Departure Policy

The Computer Science department strictly follows the official academic calendars and requires students who are enrolled in face-to-face sections must be on campus by the first-class day of each semester and leave campus no earlier than the last day with scheduled course activities. The only exception we make is for incoming new international students who often need more time to obtain the necessary paperwork including study visa, and in such case, we accommodate late arrival for up to the 12th class day of their first semester. No exceptions will be made for late return or early departure requests from current students in general. If it is because of an unforeseen and uncontrollable situation, a student needs early departure or late return, then the student must obtain an in-advance approval from the academic advisors and instructors of all enrolled courses for an excused absence of four (4) or less weekdays and an additional in-advance approved Extended Absence Verification* from the Office of the Dean of Students for an extended absence of five (5) or more weekdays. If a student has unexcused absences, then the student must take the full responsibilities of any missed classes, or missed academic work, or any financial issues caused.

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* Extended Absence Verification Request to be verified by Office of the Dean of Students: https://cm.maxient.com/reportingform.php?TexasTechUniv&layout_id=6

Safety and Wellness

The Texas Tech University (TTU) and Edward E. Whitacre Jr. College of Engineering are committed to the safety and wellness of our students by providing various services and resources.

Make sure you register with Tech Alert to get emergency notification by phone call, text, or email. You are encouraged to review the Emergency Action Plans (EAPs) and watch the videos of Know What To Do In Emergency Events and Surviving an Active Shooter Event Training to be prepared for those emergency situations. Additionally, due to the nature of laboratory or design courses, it is mandatory for you to follow the university safety policies and any additional safety protocols required by the course instructor(s).

For your wellbeing, various services are available at Student Counseling Center and Student Health Services. The Student Wellness Center provides convenient walk-in services M-F from 8 AM to 5 PM. Furthermore, the Texas Tech Crisis HelpLine (806-742-5555) provides 24/7/365 assistance for students experiencing a crisis or distress.

Emergency/Crisis Phone Number

TTU Police (UPD) Emergency	911
TTU Police (UPD) Non-Emergency	806.742.3931
TTU Emergency Maintenance	806.742.4OPS (4677)
TTU EHS (M-F, 8 am – 5 pm)	806.742.3876
SafeRide	806.742.RIDE (7433)
TTU Crisis HelpLine	806.742.5555
Student Wellness Center (From Urgent Care to a Full-Service Pharmacy on site)	806.742.2848
Title IX Reporting	806.742.7233
The Dean of Students	806.742.2984

Other info:
https://www.depts.ttu.edu/tlpdc/RequiredSyllabusStatements.php
https://www.depts.ttu.edu/tlpdc/RecommendedSyllabusStatements.php
https://www.depts.ttu.edu/tlpdc/AI_Resources/AI-Use-is-Prohibited.pdf

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