**Course Syllabus**

# CSCI549-01B

# AUTOMATA THEORY

**Summer I, 2025**

**Class Meetings**: Web-based, 6/2/2025-7/3/2025

**Instructor**:


| | |
|---|---|
| Name: | Dr. S. Suh |
| | Regents Professor, Texas A&M University System |
| | Professor, Computer Science, Texas A&M University-Commerce |
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| Office Hours: | TBA |
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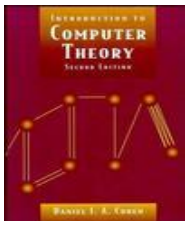
**Textbook required**:

*Introduction to Computer Theory* by Daniel I. A. Cohen
John Wiley & Sons, Inc., 1997, 2nd Ed. ISBN 0-471-13772-3




**Textbook Organization**:

PART I: Chapters 1,2,3,4,5,6,7,8,9,10 and 11
PART II: Chapters 12,13,14,15,16 and 17
PART III: Chapters 19 and 20

**Course Description**:
Hours (3 SCH). This course teaches the general theory, concept, and techniques related to the theory of automata. Practical examples related to programming languages are emphasized. Students will have the opportunity to utilize theoretical aspects of automata theory by performing a medium-scale design project. Topics include: Finite Automata, Transition Graphs, Nondeterminism, Finite Automata with Output, Context-Free Grammars, Regular Grammars, Chomsky Normal Form, Pushdown Automata, Context-Free Languages, Non-Context-Free Languages, Parsing, and Turing Machines. Prerequisite: CSCI 515.

**Course Objectives**:
This course is one of the five core courses for M.S. degree in Computer Science at Texas A&M University - Commerce. The primary goal of this course is to provide fundamental introduction to the design of programming languages (PL). Both the theoretical foundations of PL and its practical aspect will be studied by covering chapters 1 through 20. The fundamental topics to be covered in this course include regular expressions, finite automata, (non-)regular languages, context-free grammars, regular grammars, Chomsky normal forms, pushdown automata, (non-)context-free languages, parsing and Turing machines. These fundamentals are essential prerequisite for those who may pursue more advanced topics and applications of Computer Science. Since the ultimate goal of automata theory is the construction of efficient program languages, no study of automata is complete without some experience designing grammars. For this purpose, a medium-scale program language design project will be assigned as a class

project. The design project is an essential part of the successful course completion. The grading will be based on the following criteria:

**STUDENT LEARNING OUTCOMES (SLO)**:

1. Understand the concept of formal languages through such mechanism as regular expression, recursive definitions, finite automata, transition graph, Mealy machine and Moore machine.
2. Apply Kleene's theorem and pumping lemma for the design and management of regular and non-regular languages.
3. Construct context free, regular, Chomsky normal form grammars to design computer languages
4. Design and construct pushdown automata and Turing machines for a computer language
5. Design and implement a CKY parser for a computer language

**COURSE REQUIREMENTS:**

**Minimal Technical Skills Needed**

Using Microsoft Word and PowerPoint, using presentation and graphics programs, etc.

**Instructional Methods**

Delivery modalities: Face to face blended with D2L online platform
Course structure: Lecture-oriented course
Learning activities: Interactive problem-solving in class, Q&A session, team projects and exercise practice
Assessments: Quizzes, tests, project development, and presentation

**Tips for Success in the Course**

Completion of weekly exercise assignment (2 hours estimated weekly)
Weekly preview of chapters to be covered (2 hours estimated weekly)
Review of chapters covered (1 hour estimated weekly)

**Student Responsibilities:**

Regular attendance of class. In case of absence, the student is responsible for the make-up of covered material.

**Relationship between the assessments and course-level student learning outcomes:**

| Student Learning Outcomes | SLO1 | SLO2 | SLO3 | SLO4 | SLO5 |
|---|---|---|---|---|---|
| Assessment Methods Used | Midterm Exam, Quizzes | Midterm Exam, Quizzes | Final Exam, Quizzes | Final Exam, Quizzes | Course Project, Project Test |

**TECHNOLOGY REQUIREMENTS (LMS)**

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:
https://community.brightspace.com/s/article/Brightspace-Platform-Requirements

LMS Browser Support:
https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm

YouSeeU Virtual Classroom Requirements:
https://support.youseeu.com/hc/en-us/articles/115007031107-Basic-System-Requirements

## ACCESS AND NAVIGATION

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@tamuc.edu**.**

**Note:** Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

## COMMUNICATION AND SUPPORT

### Brightspace Support

### Need Help?

### Student Support

If you have any questions or are having difficulties with the course material, please contact your Instructor.

### Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:
https://community.brightspace.com/support/s/contactsupport

### System Maintenance

D2L runs monthly updates during the last week of the month, usually on Wednesday. The system should remain up during this time unless otherwise specified in an announcement. You may experience minimal impacts to performance and/or look and feel of the environment.

## COMMUNICATION AND SUPPORT:

Preferred form of communication: Email
Communication response time: 48 hours

## COURSE AND UNIVERSITY PROCEDURES/POLICIES

**Course Policies:**

Attendance/Lateness: Students are expected to be present at all class lectures. The maximum number of excused absences allowed per semester will be 3. 3 or more absences will automatically result in F as course grade.

Late Work: Under no circumstances will the late work be accepted. If a student is absent from class on the due date of any assignment, they are expected to make alternative arrangements to assure that the assignment is turned in ON TIME. Credit will be given for ONLY those assignments, programs, and/or projects turned in no later than the deadline as announced by the instructor of this class.

Missed Exams and Quizzes: Missed exams and quizzes will result in 0 in all circumstances.

Extra Credit: No extra credit work will be given under any circumstances.

Withdrawal: Any student wishing to withdraw from the course must do so officially as outlined in the class schedule. THE INSTRUCTOR CANNOT DROP OR WITHDRAW ANY STUDENT.

**Syllabus Change Policy:**

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

**UNIVERSITY SPECIFIC PROCEDURES**

**Student Conduct:**

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the Student Guidebook. http://www.tamuc.edu/admissions/registrar/documents/studentGuidebook.pdf Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: Netiquette http://www.albion.com/netiquette/corerules.html

**TAMUC Attendance:**

For more information about the attendance policy please visit the Attendance webpage and Procedure 13.99.99.R0.01.
http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf

**Academic Integrity:**

Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

Undergraduate Academic Dishonesty 13.99.99.R0.03
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf

Graduate Student Academic Dishonesty 13.99.99.R0.10
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/graduate/13.99.99.R0.10GraduateStudentAcademicDishonesty.pdf

**ADA STATEMENT**

**Students with Disabilities:**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

**Office of Student Disability Resources and Services:**

Texas A&M University-Commerce
Gee Library- Room 162
Phone (903) 886-5150 or (903) 886-5835
Fax (903) 468-8148
Email: studentdisabilityservices@tamuc.edu
Website: Office of Student Disability Resources and Services
http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/

**Nondiscrimination Notice:**

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

**Campus Concealed Carry Statement:**

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the Carrying Concealed Handguns On Campus document and/or consult your event organizer.

Web url:
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903- 886-5868 or 9-1-1.

**Smoke, Vapor & Tobacco Free Environment:**

University Procedure 34.05.99.R1 now prohibits the use of vapor/electronic cigarettes, smokeless tobacco, snuff and chewing tobacco inside and adjacent to any building owned, leased, or operated by A&M – Commerce.

**Method of Evaluation (*Tentative*):**

| | |
|---|---|
| Midterm Exam | (30%) |
| Final Exam | (50%) |
| Project | (10%) |
| Quiz | (10%) |

Final grades in this course will be based on the following scale:
A = 90%-100%
B = 80%-89%
C = 70%-79%
D = 60%-69%
F = 59% or Below

**COURSE OUTLINE/CALENDAR:**

| UNITS | SUBJECTS TO BE COVRED |
|---|---|
| (6/02) M | Chapters 1 (Introduction to Automata Theory); Chapters 2 & 3 (Languages and Recursive Definitions) - Languages, Kleene Closure, Terminology, Recursive Definition, Arithmetic Expression |
| (6/05) R | Chapters 4 (Regular Expressions) - Regular Expressions, Regular Languages, EVEN-EVEN; Chapter 5 (Finite Automata) - Definitions of Finite Automata, Examples of Finite Automata, EVEN-EVEN revisited |
| (6/9) M | Chapter 6 & 8 (TG and FA with Output), Transition Graph (Definition), Transition Graph vs. Finite Automata, Moore Machine and Mealy Machine, Moore Machine = Mealy Machine |
| (6/10) T | Quiz 1 @6PM |
| (6/12) R | Chapter 7 (Kleene's Theorem), Kleen's Theorem, TG to Regular Expression, Regular Expression to FA, Nondeterministic FA, NFA and Kleene's Theorem; Chapter 9 & 10 (Regular and Non-regular Languages), Closure Properties (Union, Intersection. Kleene Star), Complements and Intersections (Closure Properties), Pumping Lemma, Quotient Languages |
| (6/16) M | Chapter 12 (Context Free Grammars), Grammars, Context Free Grammars, Ambiguity, Total Language Trees, Syntax Trees, Generation Trees, Parse Trees, Production Trees, Derivation Trees; Chapters 13 & 16 (Non-context Free Languages), Chomsky Normal Form, Regular Grammars, Pumping Lemma for CFLs |
| (6/17) T | Midterm Exam (Chapters 1-10) @6PM |
| (6/19) R | CKY Parsing and Parser, Parser Project; Chapter 14 (Pushdown Automata), Pushdown Automata, Applications of PDA; Chapter 17 (Context Free Languages), Closure Properties, Intersection and Complement, Context Free Languages vs. Regular Languages |
| (6/23) M | Chapters 19 & 20 (Turing and Post Machines), Turing Machine |
| (6/27) F | Final Exam (Comprehensive with focus on Chapters 12-20) @11AM |
| (6/29) U | Project Presentation and Submission |