NATIONAL UNIVERSITY
of Computer & Emerging Sciences, Lahore

Department of Computer Science

CS301 – Theory of Automata

FALL 2025

Instructor Name: Rubab Anam Janjua
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Section: BCS-5F
Office Location/Number: New building First floor, Office # 51
Office Hours: Tuesday & Thursday: 11:00am-12:00pm

Course Information

Program: BS (CS)
Credit Hours: 3
Type: Core
Pre-requisite: -
Course Website: N/A
Class Meeting Time: Monday & Wednesday(1:00pm-2:30pm)
Class Venue: CS-207

Program Learning Outcomes (PLOs)

This course covers the following PLOs:

PLO#	PLO Name	PLO description
PLO2	Knowledge for Solving Computing Problems	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements
PLO3	Problem Analysis	Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines

Course Description/Objectives/Goals

This core course belongs to an important branch of computer science known as Theoretical Computer Science (TCS). TCS deals with, among other concepts, the theory of computation which focuses on automata theory, computability theory, and complexity theory. Students are gradually familiarized with different types of increasingly more powerful mathematical models of computers known as automata (plural of automaton) and the languages they can recognize.

#	Course Learning Outcomes (CLOs)	PLO#
CLO1	Identify formal language classes and prove language membership properties. Prove and disprove theorems establishing key properties of formal languages and	PLO2

	automata	
CLO2	Differentiate and manipulate formal descriptions of languages, automata and grammars with focus on non-regular and regular using automata (DFA, NFA, NFA-NULL)	PLO2
CLO3	Differentiate and manipulate formal descriptions of languages, automata and grammars with focus on context-free languages using automata (PDA and NPDA).	PLO2
CLO4	Differentiate and manipulate formal descriptions of languages, automata and grammars with focus on non context-free languages using Turing Machines	PLO3

Textbook and Reference Book

1. **John C. Martin. *Introduction to Languages and the Theory of Computation*. Fourth Edition. McGraw-Hill. ISBN: 0-07-115468-X (International Students Edition).**
2. Introduction to the Theory of Computation, Michael Sipser, 3rd Edition, Cengage Learning, 2012.
3. Introduction to Automata Theory, Languages, and Computation, John E. Hopcroft, Rajeev Motwani, and Jeffrey D. Ullman, 3rd Edition, Pearson, 2006.

Tentative Weekly Schedule

Week	Topics
1	Introduction and Revision of Basic Concepts
2	Finite Automata: DFA
3	Finite Automata: NFA
4	Finite Automata: NFA-DFA Conversion
5	Regular Languages: Regular Expressions, Equivalence with FA
6	MIDTERM EXAM 1
6	Regular Languages: Pumping Lemma
7	Context-Free Languages: CFGs
8	Context-Free Languages: PDA
9	Context-Free Languages: PDA-CFG Equivalence
10	Context-Free Languages: Pumping Lemma
11, 12	Context-Free Languages: DCFLs
12	MIDTERM EXAM 2
13	Turing Machines: Introduction
14	Turing Machines: Variants
15, 16	

	Decidability

(Tentative) Grading

1. Quizzes (15%)
2. Assignments (5%)
3. Midterm Exams (35%)
4. Final Exam (45%)

Grading Scheme: Absolute

Absolute Grading Scheme:

Total Marks (%)	Grade
≥ 90	A+
86-89	A
82-85	A-
78-81	B+
74-77	B
70-73	B-
66-69	C+
62-65	C
58-61	C-
54-57	D+
50-53	D
≤ 49	F

Course Policies

1. Announcements related to different aspects of this course (e.g. lectures, quizzes, exams, etc.) may be posted on google classroom. Students are expected to check the classroom regularly.
2. All students are expected to attend all lectures from beginning to end. Partial or full absence from a lecture without a valid reason may hamper chances for securing good grades. University's attendance requirements must be met in order to appear in the final exam.
3. Late submission of assignments is NOT allowed.
4. Students are encouraged to take full advantage of instructor's office hours. Any doubts regarding concepts covered in class or any questions regarding quizzes, assignments, etc. may be clarified during office hours. In case a student is not able to make it during office hours, he/she may schedule an appointment with the instructor for another time slot.
5. Quizzes may be announced or unannounced. A quiz will usually be about 5 – 15 minutes long and it may be given anytime during the lecture. Students missing a quiz will NOT be given a make-up quiz.
6. Students are encouraged to finish the assigned readings BEFORE the lecture. This is likely to improve lecture comprehension and class participation.
7. Students can contest their grades on quizzes and assignments ONLY within a week of the release of grades. Exams will be available for review according to university policies.
8. Students are expected to demonstrate the highest degree of moral and ethical conduct. Any student caught cheating, copying, plagiarizing, or using any other unfair means will be strictly dealt-with in accordance with university policies.

Academic Integrity

- Plagiarism and Cheating against academic integrity. Both parties involved in such cases will face strict penalty (negative marking, F grade, DC)

- CODE/ ASSIGNMENT SHARING is strictly prohibited.
- Keep in mind that by sharing your code/assignment you are not helping anyone rather hindering the learning process or the other person.
- No excuse will be entertained if your work is stolen or lost. To avoid such incidents
    - Keep back up of your code on safe online storage, such as Google Drive, Drop box or One drive.
    - Do not leave your work on university lab computer, transfer your work to online storage and delete from the university lab computer (empty recycle bin as well)