



# Department of Computer Science

## CS301 – Theory of Automata

**FALL 2022**

**Instructor Name:** Sobia Tariq Javed

**Email address:** sobia.tariq@nu.edu.pk

**Office Location/Number:** (N-203) Near Seminar Hall

**Office Hours:** Tuesday-Thursday 11:30 – 12:30

**TA Name (if any):**

**Email address:** ---@lhr.nu.edu.pk

### Course Information

**Program:** BS (CS)

**Credit Hours:** 3

**Type:** Core

**Pre-requisite:** CS211 Discrete Structures

**Course Website:** N/A

**Class Meeting Time:** Tuesday, Thursday 8:30-10:00 (5D), 10:00-11:30 (5C)

**Class Venue:** CS-10

### 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)
CLO1	Identify formal language classes and prove language membership properties
CLO2	Differentiate and manipulate formal descriptions of languages, automata, and grammars with a focus on non-regular, regular, context-free languages using automata (DFA, NFA, PDA) and Turing Machines
CLO3	Prove and disprove theorems establishing key properties of formal languages and automata
CLO4	Demonstrate a fundamental understanding of core concepts relating to the theory of computation and computational models including decidability and intractability

### 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, 3<sup>rd</sup> Edition, Cengage Learning, 2012.
3. Introduction to Automata Theory, Languages, and Computation, John E. Hopcroft, Rajeev Motwani, and Jeffrey D. Ullman, 3<sup>rd</sup> 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 (20%)
2. Assignments (10%)
3. Midterm Exams (30%)
4. Final Exam (40%)

## **Grading Scheme: Absolute**

### **Absolute Grading Scheme:**

Total Marks (%)	Grade
$\geq 90$	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
$\leq 49$	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)