
جامعة الزيتونة الأردنية
Al-Zaytoonah University of Jordan



Course Syllabus

***According to JORDAN National Qualification
Framework (JNQF)***

Course Name: Computation Theory

Course Number: 0130220

General Course Information:

Course Title	Computation Theory
Course Number	0130220
Credit Hours	3 credit hours
Education Type	Blended learning
Prerequisites/Co-requisites	Discrete Mathematics (130110)
Academic Program	Computer Science
Program Code	130
Faculty	Faculty of Science and Information Technology
Department	Computer Science
Level of Course	2
Academic Year /Semester	2025/2026 1 st Semester
Awarded Qualification	BSc
Other Department(s) Involved in Teaching the Course	-
Language of Instruction	English
Date of Production	2024-2025
Date of Revision	October 2025

Course Coordinator:

Coordinator's Name	Dr. Ayman M. Abdalla
Office No.	9-330
Office Phone Extension Number	NA
Office Hours	Sun 11:00-12:30 & 14:00-15:00, Mon 12:30-14:30, Tue 12:30-14:30, Wed 11:00-12:30, Thurs by appointment
E-mail	ayman@zuj.edu.jo

Other Instructors:

Instructor Name	
Office No.	
Office Phone Extension Number	
Office Hours	
Email	

Course Description (English/Arabic):

English	This course introduces the concepts of computation theory through the study of formal languages and automata. The topics covered include language generators such as grammars and regular expressions and language recognizers such as the different types of automata. It also introduces some basic compiler design principles, and it provides insights into algorithm analysis.
Arabic	يقدم هذا المقرر مفاهيم نظرية الحسابات من خلال دراسة اللغات الصورية والأتمتة. تشمل المواضيع التي يتم تناولها مولدات اللغة مثل القواعد النحوية والتعابير العادية وأدوات التعرف على اللغة مثل الأنواع المختلفة من آلات الأتمتة. كما يقدم أيضًا بعض المبادئ الأساسية في تصميم المترجمات، ويوفر نظرة عامة إلى تحليل الخوارزميات.

Textbook: Author(s), Title, Publisher, Edition, Year, Book website.

Ibrahim Abdulbasit, Introduction to Automata Theory: Theory of Computation, 1st Ed., 2024.

References: Author(s), Title, Publisher, Edition, Year, Book website.

1. An Introduction to Formal Languages and Automata by Peter Linz, 6th Ed, Jones & Bartlett, 2016.
2. Languages and Machines: An Introduction to the Theory of Computer Science by Thomas A. Sudkamp, 3rd Ed, Pearson, 2005.
3. Introduction to the Theory of Computation by Michael Sipser, 3rd Ed, Cengage, 2014.
4. Discrete Mathematics and Its Applications by Kenneth Rosen, 8th Ed, Mc Graw Hill, 2018.
5. Javier Esparza and Michael Blondin, Automata Theory: An Algorithmic Approach, MIT Press, 2025.
6. Stephen Anthony Fenner and Duncan A Buell, Foundation of Computation: Languages and Machines, World Scientific Publishing, 2025.

Course Educational Objectives (CEOs):

CEO1	Relate formal languages to automata theory.
CEO2	Use formal languages and automata theory in compiler design.
CEO3	Relate computation and automata theories to algorithm analysis.

Intended Learning Outcomes (ILO's):

Intended learning outcomes (ILOs)		Relationship to CEOs	Contribution to PLOs	Bloom Taxonomy Levels*	JNQF Descriptors**
K	Knowledge and Understanding				
ILO1-K	Ability to classify languages, grammars, and automata according to the Chomsky Hierarchy	CEO1	PLO2-K	Remembering	K
ILO2-K	Relating each formal language to its corresponding grammar and automaton	CEO1	PLO2-K	Understanding	K
S	Intellectual skills				
ILO3-S	Ability to design various types of automata for recognizing strings	CEO2	PLO3-S	Applying	S
ILO4-S	Ability to use regular expressions and grammars as language generators	CEO2	PLO3-S	Applying	S
ILO5-S	Ability to design and use a simple parser	CEO2	PLO4-S	Analyzing	S
C	Subject Specific Skills				
ILO6-C	Relating computation and automata theories to algorithm analysis	CEO3	PLO6-C	Evaluating	C
ILO7-C	Applying computation and automata theory in compiler design	CEO3	PLO6-C	Creating	C

***Bloom Taxonomy Levels:**

Level #	1	2	3	4	5	6
Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

**** Descriptor (National Qualification Framework Descriptors): K: Knowledge, S: Skill, C: Competency.**

Program Learning Outcome (PLOs):

(PLOs)		JNQF Descriptors**		
		K	S	C
PL01-K	Knowledge of professional ethics, social responsibility, and the regulations governing them.	X		
PL02-K	Understanding various programming techniques, the stages of software development, and the fundamental principles of security.	X		
PL03-S	Skill in applying mathematical concepts to analyze and design algorithms and verify their correctness		X	
PL04-S	Skill in using different programming languages and applying them to develop software and computer applications.		X	
PL05-C	The ability to analyze, design, and develop effective and reliable computer programs that meet user requirements and adhere to professional ethics.			X
PL06-C	The ability to keep up with continuous advancements in computer science, innovate, and work independently or as part of a team.			X
PL07-D	The ability to work collaboratively, communicate effectively, and demonstrate teamwork spirit.			X

** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)

Weekly Schedule (please choose the type of teaching)

- Face to Face (F2F)
 Hybrid (One - To - One)
 Online

Schedule of Simultaneous and their Topics:

Week	First Lecture (F2F)	Second Lecture (Activity)	ILOs	PLOs	JNQF Descriptors*
1	Mathematical Preliminaries and Notation (Sets, Set Operations)	Apply set operations	ILO1-K	PLO2-K	K
2	Mathematical Preliminaries and Notation (Functions, Relations, Graphs and Trees)	Recognize properties of relations	ILO1-K	PLO2-K	K
3	Basic Concepts of Formal Languages (Alphabet, String, String Operations)	Apply string operations	ILO1-K	PLO2-K	K
4	Basic Concepts of Formal Languages (Languages, Operations on Languages)	Apply operations on languages	ILO2-K	PLO2-K	K
5	Deterministic Finite Automata (DFA)	Design a DFA	ILO3-S	PLO3-K	S
6	Nondeterministic Finite Automata (NFA)	Design an NFA	ILO3-S	PLO3-K	S
7	Regular Expressions	Write regular expressions for given languages	ILO4-S	PLO3-K	S
Midterm Exam (30%)					
9	Converting Regular Expressions into NFAs	Convert a regular expression into an NFA	ILO4-S	PLO3-K	S

10	Grammars and the Chomsky Hierarchy	Relate formal languages to automata using the Chomsky Hierarchy	ILO2-K	PLO2-K	K
11	Context-Free Grammars & Languages	Convert a regular expression into a CFG	ILO4-S	PLO3-K	S
12	Leftmost and Rightmost Derivations & Derivation Trees	Parse (derive/recognize) a string of a CFL	ILO7-C	PLO6-K	C
13	Pushdown Automata (PDA)	Design a PDA to recognize a CFG	ILO5-S	PLO4-K	S
14	PDA Parsers	Design a PDA parser	ILO7-C	PLO6-K	C
15	Turing Machines & Linear Bounded Automata	Relate TMs to algorithm complexity	ILO6-C	PLO6-K	C
16	Final Exam				

* K: Knowledge, S: Skills, C: Competency

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- Lecture.
- Flipped learning.
- Learning through projects.
- Learning through problem solving.
- Participatory learning

Course Policies:

A- Attendance policies:

The maximum allowed absences is 15% of the lectures.

B- Absences from exams and handing in assignments on time:

Midterm exam can be retaken based on approval of excuse by the instructor's discretion.

Not handing assignment on time will incur penalties.

C- Academic Health and safety procedures

D- Honesty policy regarding cheating, plagiarism, and misbehavior:

Cheating, plagiarism, misbehavior will result in zero grade and further disciplinary actions may be taken.

E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Activities (Course Videos, Homework, Quizzes, Project) 30%
- Midterm 30%
- Final Exam 40%

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required Equipment:

- PC / Laptop with webcam and mic
- Internet Connection
- Access to the ZUJ E-Learning Platform at <https://elearning.zuj.edu.jo/>
- E-learning plan
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes (Optional)
- Homework
- Project / Presentation

Responsible Persons and their Signatures:

Course Coordinator	Dr. Ayman M. Abdalla	Completed Date	01 / 10 / 2025
		Signature	
Received by (Department Head)	Dr. Mohammad M. Abdallah	Received Date	07 / 10 / 2025
		Signature	Mohammad Abdallah
