
جامعة الزيتونة الأردنية
Al-Zaytoonah University of Jordan



Course Syllabus

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

**Course Name: Design of Compilers
and Programming Languages**

Course Number: 0130323

General Course Information:

Course Title	Design of Compilers and Programming Languages
Course Number	0130323
Credit Hours	3 credit hours
Education Type	Blended learning
Prerequisites/Co-requisites	Computation Theory (0130220)
Academic Program	Computer Science
Program Code	130
Faculty	Faculty of Science and Information Technology
Department	Computer Science
Level of Course	3
Academic Year /Semester	2024/2025 2 nd Semester
Awarded Qualification	BSc
Other Department(s) Involved in Teaching the Course	-
Language of Instruction	English
Date of Production	October 2024
Date of Revision	October 2025

Course Coordinator:

Coordinator's Name	
Office No.	
Office Phone Extension Number	
Office Hours	
E-mail	

Other Instructors:

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

Course Description (English/Arabic):

English	This module explores the principles and techniques involved in designing and implementing compilers, alongside an in-depth study of programming language concepts. Students will learn about lexical analysis, syntax analysis, semantic analysis, code generation, and optimization. The course also examines the structure, features, and paradigms of various programming languages. Practical assignments may include developing components of a simple compiler or interpreter. By the end of the module, students will have a strong understanding of how high-level code is translated into executable machine instructions.
Arabic	تستكشف هذه المادة المبادئ والتقنيات المتبعة في تصميم وتنفيذ المترجمات، إلى جانب دراسة معمقة لمفاهيم لغات البرمجة. سيتعلم الطلاب تحليل المعجم (Lexical Analysis)، تحليل النحو (Syntax Analysis)، تحليل الدلالات (Semantic Analysis)، توليد الشيفرة (Code Generation)، وتحسينها (Optimization). كما يناقش المقرر هيكل وخصائص ونماذج لغات البرمجة المختلفة. قد تشمل المهام العملية تطوير مكونات مترجم أو مفسر بسيط. بنهاية المادة، سيكون لدى الطلاب فهم قوي لكيفية تحويل الشيفرة عالية المستوى إلى تعليمات تنفيذية على مستوى الآلة.

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

Alfred V. Aho, M.S. Lam, R. Sethi, and J.D.Ullman, Compilers: Principles, Techniques, and Tools, Updated 2nd Ed, Pearson, 2023.

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

1. Hanspeter Mössenböck, Compiler Construction: Fundamentals and Applications, Springer, 2025.
2. Vinu V. Das, Compiler Design Using FLEX and YACC, PHI Learning Pvt. Ltd, 2007.
3. Clinton L. Jeffery, Build Your Own Programming Language: A programmer's guide to designing compilers, interpreters, and DSLs for modern computing problems, 2nd Ed, Packt Publishing, 2024.
4. A. Antony Prakash, Compiler Design: Principles and Techniques, Scholars' Press, 2024.
5. John I Moore, Compiler Design Using Java(R): An Object-Oriented Approach 4th Ed, Softmoore Consulting, 2024.
6. Torben Ægidius Mogensen, Programming Language Design and Implementation (Texts in Computer Science), 2nd Ed, 2025.
7. Michael Scott and Jonathan Aldrich, Programming Language Pragmatics, 5th Ed, 2025.

Course Educational Objectives (CEOs):

CEO1	Describe and distinguish the different phases of a compiler and the way they work.
CEO2	Employ computation theory in compiler design.
CEO3	Implement parts of a compiler using a high-level language.

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	Understand Language Design Criteria & Language Design Issues	CEO1	PL01-K	Understanding	K
ILO2	Learn the tasks of the different phases of a compiler how they interact.	CEO1	PL01-K	Remembering	K
S	Intellectual skills				
ILO3	Use finite automata in the design of the lexical-analysis phase.	CEO2	PL03-S	Applying	S
ILO4	Use context-free grammar in the design of the syntax-analysis and semantic analysis phases.	CEO2	PL04-S	Analyzing	S
ILO5	Use context-free grammar to generate parse trees and syntax trees.	CEO2	PL03-S	Applying	S
C	Subject Specific Skills				
ILO6	Select the algorithms and design paradigms that suit the implementation of each phase of the compiler.	CEO3	PL06-C	Evaluating	C
ILO7	Write code in a high-level language such as C++, Java, or Python to implement parts of a compiler.	CEO3	PL05-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	The Art of Language Design	The Programming Language Spectrum	IL01	PL01-K	K
2	Language Design Criteria & Design Issues	Compilation and Interpretation	IL01	PL01-K	K
3	The phases of a compiler	Code Compilation Example	IL02	PL01-K	K
4	Lexical Analysis: Definitions, Lexical Errors, Input Buffering	Video: Regular Expressions	IL03	PL03-S	S
5	Specification & Recognition of Tokens	Video: Transforming Regular Expressions into TD	IL03	PL03-S	S
6	TD for Token Recognition	Video: CFL and CFG	IL03	PL03-S	S
7	Implementation of Lexical Analyzer	Parse Trees & Ambiguity	IL05	PL03-S	S
Midterm Exam (30%)					
9	Syntax Analysis	Video: Introduction to Parsing	IL04	PL04-S	S
10	Backtracking Parsing	Video: LL(1) Grammars	IL04	PL04-S	S

11	Rectifying a CFG to become LL(1)	Predictive Parsing	IL06	PL06-C	C
12	Design of a Predictive Parser	Implementation of a Predictive Parser	IL07	PL05-C	C
13	Syntax Directed Translation	Syntax Directed Definitions	IL04	PL04-S	S
14	Syntax Tree Construction	S-Attributed Definitions	IL05	PL03-S	S
15	Translation Schemes	Directed Acyclic Graphs	IL05	PL03-S	S
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		Completed Date	
		Signature	

Received by (Department Head)		Received Date	
		Signature	
