هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	Compilers
Course Code:	CS 412
Program:	Computer Science
Department:	Computer Science
College:	College of Computer and Information Technology
Institution:	Majmaah University
Version:	V2023
Last Revision Date:	11 September 2023

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A. General information about the course:

1. Course Identification

1. Credit hours:3 (3,1,0)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (7)					
4. Course general Description: **In this course, students will develop a deeper understanding of modern compiler techniques applied to general purpose programming languages. It will give students a working knowledge of the foundations, tools, and engineering approaches used in developing formal language translators**					
5. Pre-requirements for this course (if any)**: CS270**					
6. Pre-requirements for this course (if any)**:**					
7. Course Main Objective(s): **The main objective of this course is to make students** **1. Understand the principles of compilers construction** **2. Understand the basic components of a compiler (e.g. lexical analysis, top-down, bottom-up parsing, context-sensitive analysis, and intermediate code generation)** **3. Design and implement a simple compiler** **4. Use automatic tools in the development of compilers (e.g. Lex and Yacc)**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	15
5.	**Others (specify)**	
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1				
1.2				
...				
2.0	**Skills**			
2.1	CLO-1: Students will learn, understand and explain the main techniques and algorithms used in compilers.	S1	Classroom Teaching	Class Tests, Mid Exam, Final Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	CLO-2: Students will learn how to use tools to generate lexical analyzers, parsers, translators and code generators.	S2	Mini Project Lab Exercises	Assignments, Miniproject
2.3	CLO-3: Students use open source and current software tools to build a simple compiler.	S4-CS	Mini Project Lab Exercises	Exercises/Mini Project
2.4	CLO-4: Use automatic tools in the development of compilers	S4-CS	Mini Project Lab Exercises	Exercises/Home work
3.0	**Values, autonomy, and responsibility**			
3.1				
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Compilers, Micro compilers	4
2.	Language translation, comparison of interpreters and compilers, language translation phases	4
3.	Lexical Analysis: regular expressions role in lexical scanners, formal definition of tokens, use of finite state automata	8
4.	Syntax Analysis: formal definition of grammars, BNF.	4
5.	Parsers Implementation: descent parsers, LL(1) parser.	3
6.	Parsers Implementation: Shift-reduce parsers, LR(1) parser.	3
7.	Parsers Implementation: LR(1) parser.	3
8.	Parsers Implementation: SLR(1) parser.	4
9.	Semantic Analysis: data types, type-checking models, type-checking algorithms.	4
10.	Intermediate Representation, Code Generation: intermediate and object code, intermediate representations, implementation of code generators, tree walking; context sensitive translation	4
11.	Code optimization: data-flow analysis; loop optimizations, error detection, recovery, and repair, compiler implementation	4

Total	45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	Week 3,6	10%
2.	Class Tests, quiz's	Week 4, 8	20%
3.	Mini Project	Week 5	10%
4.	Midterm Exam	Week 6	20%
5.	Final Exam	Week 12	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	A V Aho, R Sethi and J D Ullman, "Compilers: principles, techniques and tools", Pearson Education Limited; Pearson New International Edition edition; 2nd ed. (2007). ISBN-10: 1292024348, ISBN-13: 978-1292024349
Supportive References	Keith Cooper and Linda Torczon, "Engineering a Compiler", Morgan Kaufman
Electronic Materials	**Blackboard**
Other Learning Materials	Online videos to learn new tools

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (projector, smart board, software)	PC or Laptop with Windows/Linux, Smart Board, Projector
Other equipment (depending on the nature of the specialty)	Internet Connection

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	CLO Survey

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Students assessment	Instructor	Quiz, Mid exam, Assignments, Exercises, Final Exam and Indirect Survey
Quality of learning resources	Convener, instructors, HOD	Regular follow ups
The extent to which CLOs have been achieved	Instructor, TA	Performance in the exam for a particular CLO(s)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	College Council
REFERENCE NO.	Meeting #1
DATE	