



Course Specifications

Course Title:	Compiler Design
Course Code:	CSI 413
Program:	Computer Science and Information
Department:	Computer Science and Information
College:	College of Science at Az Zulfi
Institution:	Majmaah University

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A. Course Identification

1. Credit hours: (3) (2 Lec + 2 lab)
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: 8 th Level – 4 rd year
4. Pre-requisites for this course (if any): CSI 222, CSI 221
5. Co-requisites for this course (if any): N/A

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	48	80%
2	Blended	6	10%
3	E-learning	0	0%
4	Distance learning	0	0%
5	Other	6	10%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	15
3	Tutorial	15
4	Others (specify)	-
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

The goal of this course is to introduce the design and implementation of compilers. Topics include: compiler organization, algorithms for lexical, syntactic and semantic analysis, top-down and bottom-up parsing, symbol table organization, error detection and recovery, intermediate and object code generation, and code optimization. Student has to implement a compiler for a simple high level language (like mini C) as a project.

2. Course Main Objective

The goal of this course is to introduce the design and implementation of compilers. Topics include: compiler organization, algorithms for lexical, syntactic and semantic analysis, top-down and bottom-up parsing (e.g., recursive descent, LL, LR, LALR parsing), symbol table organization, error detection and recovery, intermediate and object code generation, and code optimization. Student has to implement a compiler for a simple high level language (like mini C) as a project .

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Understand the structure of compilers	k1
1.2	Understand the basic techniques used in compiler construction such as lexical analysis,	k1
1.3	top-down, bottom-up parsing, context-sensitive analysis, and intermediate code generation.	k1
2	Skills :	
2.1	Explain the core issues of Compiler design	s1
2.2	Design and implement a compiler using a software engineering approach	s1
2.3	Identify problems, and explain, analyze, and evaluate various design strategies of compilers.	s1
2...		
3	Values:	
3.1	Work in a group and learn time management.	c3
3.2	Learn how to search for information through library and internet.	c3
3.3	Communicate with teacher, ask questions, solve problems, and use computers.	c3
3.4	Use Information technology and computer skills to gather information about a selected topic	c3

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Compilers: The role of language translation in the programming process, Comparison of interpreters and compilers, Language translation phases, Machine dependent and machine independent aspects of translation, Language translation as a software engineering activity	8
2	Lexical Analysis: Application of regular expressions in Lexical Analysis, Scanning, hand coded scanner vs. automatically generated scanners, formal definition of tokens, implementation of finite state automata.	8
3	Syntax Analysis and Parsing: Revision of formal definition of grammars, BNF and EBNF, Bottom-up vs. Top-down parsing, Tabular vs. Recursive-descent parsers, Error handling,	12
4	Parser Generators: Automatic generation of tabular parsers, Symbol table management, Use of tools in support of the translation process	12
5	Semantic Analysis: Data type as set of values with set of operations, data types, Type-checking models, Semantic models of User defined types, Parametric polymorphism, Subtype polymorphism, Type checking algorithms.	8
6	Intermediate Code Generation: Intermediate and object code, intermediate representations, implementation of code generators	12



...		
Total		

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Understand the structure of compilers	Lectures Lab demonstrations Case studies Individual presentations	Written Exam Homework assignments Class & Lab Activities Quizzes
2.0	Skills		
2.1	Explain the core issues of Compiler design	Lectures Lab demonstrations	Written Exam assignments Lab Activities Quizzes
2.2	Design and implement a compiler using a software engineering approach	Case studies Individual presentations	
2.3	Identify problems, and explain, analyze, and evaluate various design strategies of compilers.	Brainstorming	
3.0	Values		
3.1	Work in a group and learn time management.	Small group discussion Whole group discussion Brainstorming Presentation	Written Exam Homework assignments Lab assignments Class Activities Quizzes
3.2	Learn how to search for information through library and internet.		
3.3	Communicate with teacher, ask questions, solve problems, and use computers.		
3.4	Use Information technology and computer skills to gather information about a selected topic		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	First written mid-term exam	6	15%
2	Second written mid-term exam	12	15%
3	Class activities, group discussions, Presentation	Every 2 weeks	10%
4	Homework + Assignments	After Every chapter	10%
5	Electronic exam	14	10%
6	Lab activities	15	40%
7	Final written exam	16	15%
8			

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

- 6-office hours per week in the lecturer schedule.
- The contact with students by e-mail, mobile, office telephone, website and BlackBoard.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Dick Grune, Kees van Reeuwijk, Henri E. Bal, Criel J.H. Jacobs, Koen Langendoen, “Modern Compiler Design”, ISBN 978-1-4614-4698-9, Springer New York Heidelberg Dordrecht London, 2 nd 2012.
Essential References Materials	https://www.isi.edu/~pedro/Teaching/CSCI565-Spring16/
Electronic Materials	https://www.coursera.org/
Other Learning Materials	Videos and presentations made available on BlackBoard e-Learning platform.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms with required digital aids and to support traditional method of teaching using blackboard. Classrooms with proper lighting and air conditioning system integrated with the sound System /audio system. Classroom with smart board interface, display screen and a computer to aid the sessions
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart Board with supporting software / computers with updated versions of software as required to understand the subject concepts.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	N/A

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Strategies for Obtaining Student Feedback on Effectiveness of Teaching	Instructor	Analysis of students' results. Observation during class work. Students' evaluations.

Evaluation Areas/Issues	Evaluators	Evaluation Methods
		<p>Colleagues' evaluations. Evaluation questionnaire filled by the students. Interview a sample of students enrolled in the course to solicit their opinions</p>
Other Strategies for Evaluation of Teaching	the Department	<p>Self-assessment. External evaluation. Periodic review of course (the Commission of study plans).</p>
Processes for Improvement of Teaching	the Department	<p>Taking into account the recommendations yielded from the internal review of the course. Guidelines about teaching the course provided by the study plans commission. Department guidelines pertaining the faculty member's performance acquired using direct observation. Training and development. Workshops to improve the educational process</p>
Processes for Verifying Standards of Student Achievement	Instructor	<p>check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution. Instructors of the course working together with Head of Department to adopt a unique process of the evaluation.</p>
Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.	Instructor	<p>Comparison of the course to its counterparts offered in similar departments. Periodic revision of course description by faculty member. Periodic revision of course description by the study plans and schedules Commission. Update learning resources related to the course to ensure that the course is up-to-date with the developments in the field. Make use of statistical analysis of course evaluation carried out by the students to improve and develop the course. Provide an opportunity to the students to express their opinions about what is taught and receive suggestions and evaluate their effectiveness.</p>

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

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

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

