Compiler Design

Course Code:

CSE 457

Course Period:

Spring

Course Type:

Area Elective

Credits:

3

Theoric:

3

Practice:

0

Laboratory Hour:

0

ECTS:

5

Prerequisite Courses:

Automata Theory and Formal Languages [1]
Course Language:

English

Course Coordinator:

Gürhan Küçük [2]
Courses given by:

Gürhan Küçük [2]
Course Objectives:

The aim of this course is to provide students with the knowledge and abilities to design and implement compilers.

Course Content:

This course introduces students to compilers by describing the methods for translating a formal language to another formal language. It describes the steps of compilation starting with the scanner, and then, followed by the parser design and implementation. The course also provides information on semantic analysis and local and global compiler optimization algorithms. During the course, each student is expected to implement a simple compiler using lex and yacc tools.

Course Methodology:

1: Lecture, 2: Question-Answer, 3: Lab, 4: Case-study

Course Evaluation Methods:

A: Testing, B: Experiment, C: Homework, D: Project

Course Learning Outcomes	Program Learning Outcomes	Teaching Methods	Assessment Methods
1) Basic knowledge of compilation steps; ability to apply automata theory and knowledge on formal languages.	1,6	1,2,4	A, C, D
2) Ability to design and implement scanner modules in compilers.	3,4,6	1,2	B, C, D
3) Ability to identify and select suitable parsing strategies for a compiler for various cases. Knowledge in alternative methods (top-down or bottom-up, etc).	1,4,6	1,2,4	A, C
4) Knowledge and ability to devise, select, and use modern techniques and tools needed to design and implement compilers.	4,6	1,2	B, D

COURSE CONTENT

Week	Topics	Study Materials
1	INTRODUCTION TO COMPILERS	Textbook, Slides

2	SCANNERS I (REGULAR LANGUAGES, LEXICAL SPECIFICATIONS)	Textbook, Slides
3	SCANNERS II (RE à NFA à DFA à minDFA à IMPLEMENTATION)	Textbook, Slides
4	PARSERS I (CFGs, PARSE TREES, TOP-DOWN PARSERS)	Textbook, Slides
5	PARSERS II (RECURSIVE DESCENT, PREDICTIVE PARSERS)	Textbook, Slides
6	MIDTERM EXAM I	Textbook, Slides
7	PARSERS III (BOTTOM-UP PARSERS)	Textbook, Slides
8	PARSERS IV (SHIFT-REDUCE PARSING, SLR, LR(K) PARSERS)	Textbook, Slides
9	CONTEXT SENSITIVE ANALYSIS	Textbook, Slides
10	INTERMEDIATE REPRESENTATIONS	Textbook, Slides
11	PROCEDURE ABSTRACTION	Textbook, Slides
12	MIDTERM EXAM II	Textbook, Slides
13	CODE SHAPE, OPTIMIZATIONS I (LOCAL OPTIMIZATIONS)	Textbook, Slides
14	OPTIMIZATIONS II (GLOBAL OPTIMIZATIONS)	Textbook, Slides

RECOMMENDED SOURCES

Textbook	A.V. AHO, M.S. LAM, R. SETHI, J.D. ULLMAN, “COMPILERS: PRINCIPLES, TECHNIQUES AND TOOLS, 2nd ED., ADDISON WESLEY, 2006. K.D. COOPER, L. TORCZON, “ENGINEERING A COMPILER”, 2nd ED., MORGAN KAUFMANN, 2012.
Additional Resources	PRESENTATION SLIDES ON COADSYS

MATERIAL SHARING

Documents
Assignments
Exams

ASSESSMENT

IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	1	62
Assignment	5	15
Term Project	1	23
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		35
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		65
Total		**100**

COURSE'S CONTRIBUTION TO PROGRAM

No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied information in these areas to model and solve engineering problems.					**X**
2	Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.					
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.					**X**
4	Ability to devise, select, and use modern techniques and tools needed for engineering practice; ability to employ information technologies effectively.					**X**
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating engineering problems.					

6	Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.	**X**
7	Ability to communicate effectively both orally and in writing; knowledge of a minimum of one foreign language.	
8	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.	
9	Awareness of professional and ethical responsibility.	
10	Information about business life practices such as project management, risk management, and change management; awareness of entrepreneurship, innovation, and sustainable development.	
11	Knowledge about contemporary issues and the global and societal effects of engineering practices on health, environment, and safety; awareness of the legal consequences of engineering solutions.	

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 13x Total course hours)	13	3	39
Hours for off-the-classroom study (Pre-study, practice)	14	2	28
Midterm examination	2	1.5	3
Homework	5	4	20
Project	1	35	35
Final examination	1	3	3
Total Work Load			128
Total Work Load / 25 (h)			5.12
ECTS Credit of the Course			5