Computer Architectures

Course Code:

CSE 427

Course Period:

Autumn

Course Type:

Area Elective

Credits:

3

Theoric:

3

Practice:

0

Laboratory Hour:

0

ECTS:

5

Prerequisite Courses:

Introduction to Digital Systems [1]
Course Language:

English

Course Coordinator:

Gürhan Küçük [2]
Courses given by:

Gürhan Küçük [2]
Course Objectives:

The aim of this course is to present students the fundamentals of computer architecture so that they will be able to understand the role of the hardware and software in the lower machine levels.

Course Content:

Fundamentals of computer design, instruction set principles, pipelining and pipeline hazards, instruction level parallelism, overcoming pipeline hazards, static and dynamic instruction scheduling mechanisms, memory-hierarchy design.

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) Adequate knowledge in computer architecture concepts; ability to use theoretical and applied information in these areas to model and solve engineering problems.	1,6	1,2	A, C
2) Ability to explain, compare, and contrast different architectures and organizations in terms of various metrics.	8,11	1,2	A, C
3) Adequate knowledge and ability to apply both static and dynamic instruction scheduling methods.	2,6	1,2	A, C
4) Adequate knowledge in superscalar pipelined processors, dynamic branch prediction, simultaneous multithreading, multicore processors and memory hierarchy subjects.	1,8,11	1,2,4	A, C

COURSE CONTENT

Week	Topics	Study Materials
1	INTRODUCTION	
2	MEASURING AND REPORTING PERFORMANCE, POWER	

3	INSTRUCTION SET PRINCIPLES, MIPS ISA
4	BASIC PIPELINE THEORY, MULTICYCLE OPERATIONS
5	INSTRUCTION LEVEL PARALLELISM, PIPELINE HAZARDS
6	REDUCING BRANCH PENALTIES
7	MIDTERM EXAM I
8	STATIC SCHEDULING
9	DYNAMIC SCHEDULING
10	SUPERSCALAR PROCESSORS, REGISTER RENAMING
11	MEMORY SYSTEM I – CACHES
12	MEMORY SYSTEM II – MAIN AND VIRTUAL MEMORY
13	MIDTERM EXAM II
14	PROCESSORS OF TODAY AND THE FUTURE

RECOMMENDED SOURCES

Textbook	HENNESSY, J., PATTERSON, D., “COMPUTER ARCHITECTURE: A QUANTITATIVE APPROACH”, 5th Ed., MORGAN KAUFMANN (TEXTBOOK)
Additional Resources	Lecture Notes: http://cse.yeditepe.edu.tr/v2/en/academic/course-pages [3] Lab material: http://cse.yeditepe.edu.tr/v2/en/academic/course-pages [3]

MATERIAL SHARING

Documents	
Assignments	Homework assignments are on 1) processor performance, 2) ISA, 3) pipelining, 4) static and dynamic scheduling, 5) memory hierarchy subjects.
Exams	The first midterm examination covers processor performance, ISA, pipelining and dynamic branch prediction, and the second midterm examination covers static and dynamic instruction scheduling, superscalar and out-of-order execution, register renaming and memory hierarchy subjects. Final examination covers all the topics.

ASSESSMENT

IN-TERM STUDIES	NUMBER	PERCENTAGE
Mid-terms	2	40
Quizzes	5	15
Assignment	5	15
Total		**70**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		30
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		70
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.				**X**	
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.					
4	Ability to devise, select, and use modern techniques and tools needed for engineering practice; ability to employ information technologies effectively.					
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.	**X**
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.	**X**

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 12x Total course hours)	12	3	36
Hours for off-the-classroom study (Pre-study, practice)	14	4	56
Midterm examination	2	3	6
Homework	5	3	15
Final examination	1	3	3
Total Work Load			116
Total Work Load / 25 (h)			4.6
ECTS Credit of the Course			5