ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINEERING & SCIENCE
MATERIALS SCIENCE AND MECHANICAL ENGINEERING PROGRAM
COURSE DESCRIPTION AND SYLLABUS

Course Title	Code	Semester	T+L Hours	Credit	ECTS
COMPUTER ARCHITECTURE	ECE-581	FALL	3 + 0	3	10

Prerequisite Courses	-

Type	Selective
Language	English
Coordinator	Asst. Prof. Gülay Yalçın
Instructor	Asst. Prof. Gülay Yalçın
Adjunt	none
Aim	This course provides the major concepts and design philosophies of computer architecture and explains the principles, tradeoffs, and implementation details of microprocessors. The course introduces the basic mechanisms such as pipeline, branch prediction, multi-threaded execution which are utilized in the current state of the art microprocessors. Also, laws of performance evaluation of a modern computer will be explained in the course to measure if a computer meets functional, performance, energy consumption, cost, and other specific goals. After completing the course, students will get a basic understanding about the topics relevant to design of microprocessors of the present and will be able to foresee problems and possible solution directions for the future architectural designs.
Learning Outcomes	To give an opportunity to students for 1. An ability to analyze and evaluate the performance of a microarchitecture, 2. An ability to define the architectural requirements of a computer system in terms of power, performance and reliability, 3. An ability to design a microarchitecture or a component to meet desired needs within realistic constraints, 4. An ability to identify the possible problems of future computer architectures, 5. An understanding of existing architectural solutions and evaluate its drawbacks.
Course Content	• Introduction and focus of Computer Architecture • Fundamental Concepts and Tradeoffs: ISA, Microarchitecture, System • Single-Cycle Machine, Pipeline, Performance Measurement • Pipeline, Out-of-Order Execution, Superscalar Processor • Advanced branch handling • Virtual Memory • Memory Hierarchy

WEEKLY TOPICS AND PRELIMINARY STUDY

Week	Topic	Preliminary Study
1	Introduction and Focus of Computer Architecture	The relevant articles from the literature
2	Fundamental Concepts and Tradeoffs: ISA, Microarchitecture, System	The relevant articles from the literature
3	Single-Cycle Machine, Pipeline, Performance Measurement	The relevant articles from the literature
4	Pipeline, Out-of-Order Execution, Superscalar Processor	The relevant articles from the literature
5	Out-of-Order Execution, Superscalar (Continued)	The relevant articles from the literature
6	Branch Prediction	The relevant articles from the literature
7	Midterm	The relevant articles from the literature
8	Register Dataflow	The relevant articles from the literature
9	Memory Dataflow	The relevant articles from the literature
10	Virtual Memory	The relevant articles from the literature

11	Memory Hierarchy	The relevant articles from the literature
12	Memory Hierarchy (Continued)	The relevant articles from the literature
13	Parallel Execution - SMT	The relevant articles from the literature
14	Parallel Execution – CMP	The relevant articles from the literature
15	Review	The relevant articles from the literature
16	Final Exam	

SOURCES	
Lecture Notes	Lecture slides
Other Sources	**Course Textbook:** • "Computer Architecture: A Quantitative Approach" by Hennessy and Patterson, Morgan Kaufmann/Elsevier, 5th Edition **Additional Materials:** • Computer Architecture and Implementation by Harvey Cragon, Cambridge University Press • Structured Computer Organization by Andrew Tanenbaum, Prentice Hall

COURSE MATERIALS SHARING	
Documents	Lecture notes, slides
Homeworks	Students will be given 5 homework in the semester
Exams	1 Midterm and 1 Final Exam

EVALUATION SYSTEM		
SEMESTER STUDY	**NUMBER**	**CONTRIBUTION**
Midterm	1	30
Homework	5	20
Quiz	2	10
SUB-TOTAL		60
Contribution of Semester Study		60
Contribution of Final Exam	1	40
TOTAL		100

Course Category	
Sciences and Mathematics	50%
Engineering	50%
Social Sciences	0%

RELATIONSHIPS BETWEEN LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS							
No	Program Qualifications	Contribution Level				
		1	2	3	4	5
1	The skills of using mathematics, science and engineering information in advanced research					**X**
2	The skills of analyzing, designing and/or implementing an original system that will be able to solve an engineering problem,					**X**
3	The skills of using the required software, hardware and modern measurement equipments in their field of research,				**X**	
4	The skills of planning independent research and implementing in detail,				**X**	
5	The skills of following literature, listening to and making technical presentation, writing a paper in academic level,					**X**
6	The skills of innovative and interrogative thinking and finding original solutions					**X**

*Increasing from 1 to 5.

ECTS / WORK LOAD TABLE			
Activities	Number	Duration (Hours)	Total Work Load
Course Length (includes exam weeks: 16x total course hours)	16	3	48
Out-of-class Study Time (Pre-study, practice)	16	2	32
Internet search, library work, literature search	16	1	16
Homework	5	30	150
Midterm	1	30	30
Final Exam	1	40	40
Total Work Load			316
Total Work Load / 30			316/30
Course ECTS Credit			10