

EPOKA UNIVERSITY

FACULTY OF ARCHITECTURE AND ENGINEERING DEPARTMENT OF COMPUTER ENGINEERING COURSE SYLLABUS

COURSE INFORMATION							
Course Title: COMPUTER ORGANIZATION							
Code	Course Type	Regular Semester	Lecture	Recit.	Lab	Credits	ECTS
CEN 219	B	3	-	-	-	3	6
Lecturer and Office Hours:		Betim Çiço					
Second Lecturer(s):							
Teaching Assistant(s) and Office Hours:							
Language:		English					
Compulsory/Elective:		Compulsory					
Classroom and Meeting Time:							
Course Description:		-					
Course Objectives:		The main objective of the course is to introduce students to the computer organisation from hardware and programming . This course teaches students fundamental knowledge in computer architecture and microarchitecture. The course covers the basic organizations of computer systems including instruction-set architecture, execution pipeline, memory hierarchy, and I/O subsystem. It also addresses advanced processor microarchitecture issues such as dynamic instruction scheduling, branch prediction, lock-up free caches, instruction-level parallelism, multiple instruction fetch/issuing, speculative execution, etc. to improve computer processor performance. Shared-memory multiprocessor systems with coherent caches to reduce memory access latency are also covered. Finally, it outlines the verification issues of today's microprocessors.					
COURSE OUTLINE							
Week	Topics						
1	Introduction: Digital computer generation, computer types and classifications, functional units and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer.						
2	Central Processing Unit: Addition and subtraction of signed numbers, look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation Processor organization, general register organization, stack organization.						
3	Addressing modes. Assembler language.						
4	Addressing modes. Assembler language.						
5	Control Unit: Instruction types, formats, instruction cycles and subcycles (fetch and execute etc) , micro-operations, execution of a complete instruction.						
6	Hardware and microprogrammed control: microprogramme sequencing, wide branch addressing, microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.						
7	Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2D memory organization. ROM memories.						
8	Midterm Exam.						
9	Cache memories: concept and design issues, performance, address mapping and replacement.						
10	Virtual memory: concept implementation. Auxiliary memories: magnetic disk, magnetic tape and optical disks.						
11	Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions.						
12	Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.						
13	Pipelining: Basic and Intermediate Concepts. Instruction-Level Parallelism and Its Exploitation						
14	Modern Multicore Architecture, Multiprocessors and Thread-Level Parallelism						
Prerequisite(s):		Introduction in Computer Engineering, Data Structures and Algorithms and programming knowledge is required.					
Textbook:		Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw, Hill, 2002. 2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.					
Other References:		1. Patterson, Computer Organisation and Design, Elsevier Pub. 20092. Vravice,Hamacher & Zaky, "Computer Organization", TMH 3. Mano," Computer System Architecture", PHI 4. John P Hays, " Computer Organization", McGraw Hill 5. Tannenbaum," Structured Computer Organization", PHI 6. P Pal chaudhry, ' Computer Organization & Design', PHI					
Laboratory Work:							
Computer Usage:							
Others:		No					
COURSE LEARNING OUTCOMES							
1	Knowledge of digital computer generation, computer types and classifications, functional units and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer.						

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2	Knowledge on Central Processing Unit: Addition and subtraction of signed numbers, look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation Processor organization, general register organization, stack organization and addressing modes.
3	Ability to use on low level Assembler language.
4	Knowledge on Control Unit: Instruction types, formats, instruction cycles and subcycles (fetch and execute etc) , micro-operations, execution of a complete instruction. Hardware and microprogrammed control: microprogramme sequencing, wide branch addressing, microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.
5	Knowledge on Memory: Basic concept and hierarchy, semiconductor RAM memories, memory organization. ROM memories. Cache memories: concept and design issues, performance, address mapping and replacement) Auxiliary memories: magnetic disk, magnetic tape. Virtual memory: concept implementation.
6	Knowledge about Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programme I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors.
7	Knowledge about Communication protocols: Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.
8	Knowledge about Pipelining: Basic and Intermediate Concepts. Instruction-Level Parallelism and its Exploitation.
9	Knowledge about modern multicore architecture, Multiprocessors and Thread-Level Parallelism

COURSE CONTRIBUTION TO... PROGRAM COMPETENCIES (Blank : no contribution, 1: least contribution ... 5: highest contribution)

No	Program Competencies	Cont.
BA CEN Program		
1	Engineering graduates with sufficient theoretical and practical background for a successful profession and with application skills of fundamental scientific knowledge in the engineering practice.	5
2	Engineering graduates with skills and professional background in describing, formulating, modeling and analyzing the engineering problem, with a consideration for appropriate analytical solutions in all necessary situations.	5
3	Engineering graduates with the necessary technical, academic and practical knowledge and application confidence in the design and assessment of machines or mechanical systems or industrial processes with considerations of productivity, feasibility and environmental and social aspects.	5
4	Engineering graduates with the practice of selecting and using appropriate technical and engineering tools in engineering problems, and ability of effective usage of information science technologies.	5
5	Ability of designing and conducting experiments, conduction data acquisition and analysis and making conclusions.	5
6	Ability of identifying the potential resources for information or knowledge regarding a given engineering issue.	4
7	The abilities and performance to participate multi-disciplinary groups together with the effective oral and official communication skills and personal confidence.	3
8	Ability for effective oral and official communication skills in foreign language.	4
9	Engineering graduates with motivation to life-long learning and having known significance of continuous education beyond undergraduate studies for science and technology.	4
10	Engineering graduates with well-structured responsibilities in profession and ethics.	5
11	Engineering graduates who are aware of the importance of safety and healthiness in the project management, workshop environment as well as related legal issues.	4
12	Consciousness for the results and effects of engineering solutions on the society and universe, awareness for the developmental considerations with contemporary problems of humanity.	4

COURSE EVALUATION METHOD

Method	Quantity	Percentage
Homework	4	2.50
Midterm Exam(s)	1	30
Quiz	2	5
Final Exam	1	50
	Total Percent:	100%

ECTS (ALLOCATED BASED ON STUDENT WORKLOAD)

Activities	Quantity	Duration(Hours)	Total Workload(Hours)
Course Duration (Including the exam week: 16x Total course hours)	16	3	48
Hours for off-the-classroom study (Pre-study, practice)	16	3	48
Mid-terms	1	14	14
Assignments			0
Final examination	1	20	20
Other	1	20	20

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Total Work Load:	150
Total Work Load/25(h):	6
ECTS Credit of the Course:	6