University POLITEHNICA of Bucharest
Faculty of Electronics, Telecommunications and Information Technology

COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	University POLITEHNICA of Bucharest
1.2 Faculty	Electronics, Telecommunications and Information Technology
1.3 Department	Dept. of Electronic Devices, Circuits and Architectures
1.4 Domain of studies	Electronics, Telecommunications and Information Technologies, Computers and Information Technology
1.5 Cycle of studies	Bachelor (engineering)
1.6 Program of studies/Qualification	All

2. Course identification information

2.1 Name of the course				Microprocessor Architecture			
2.2 Lecturer				Prof. Corneliu Burileanu			
2.3 Instructor for practical activities				Asist. Diana Şandru			
2.4 Year of studies	II	2.5 Semester	II	2.6 Evaluation type	Exam	2.7 Course choice type	Compulsory

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	4	3.2 course	3	3.3 practical activities	1
3.4 Total hours in the curricula, out of which	56	3.5 course	42	3.6 practical activities	14

Distribution of time	hours
Study according to the manual, course support, bibliography and hand notes	14
Supplemental documentation (library, electronic access resources, in the field, etc)	14
Preparation for practical activities, homeworks, essays, portfolios, etc.	14
Tutoring	0
Examinations	3
Other activities	0

3.7 Total hours of individual study	42
3.9 Total hours per semester	98
3. 10 Number of ECTS credit points	5

4. Prerequisites (if applicable)

4.1 curricular	Computer programming Data structures and Algorithms

4.2 competence-based	Applying knowledge about the basic concepts and methods of programming languages and techniques

5. Requisites (if applicable)

5.1 for running the course	Room equipped with a video projector.
5.2 for running of the applications	Room equipped with computers and specific software. Compulsory presence at laboratory classes, according to current PUB regulations.

6. Specific competences

Professional competences	C2. Design of hardware, software and telecommunication systems C2.1 Description of the structure and of the architecture for hardware, software and telecommunication systems C2.2 Explaining the purpose and the operation details for hardware, software and telecommunication systems C4. Using programming technologies and environments
Transversal competences	Honorable, responsible and ethical behavior to ensure the reputation of the profession. Awareness of the need for continuous training; efficient use of resources and learning techniques for personal and professional development.

7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	Study of the basic concepts in CISC and RISC general microprocessor architecture: registers, memory management, addressing techniques, data transfer, instruction set, input/output strategies. The students should have the possibility to approach any specific microprocessor architecture, either general or dedicated.
7.2 Specific objectives	During the laboratories, the architecture attributes for Intel x86 compatible microprocessors in real mode are pointed out. Specific software tools are used in order to facilitate the access to system resources. The main purpose is to present the characteristics of the well known IA32 architecture.

8. Content

8.1 Lectures	Teaching techniques	Remarks
1. Microcomputer Structure. Definitions 1.1. Microcomputer Functional Blocks 1.2. CISC and RISC Microprocessors 1.3. Information in Digital Systems 1.4. Conventions	The lectures are presented in a multimedia amphitheatre	6 hrs

2. Overview of a CISC, General Purpose Microprocessor Core 2.1. First Step Approach: Data register and Address Register 2.2. Second Step Approach: General-Purpose Registers 2.3. Third Step Approach: Arithmetic Processing Unit 2.4. Forth Step Approach: Memory Addressing Control Unit 2.5. Fifth Step Approach: Microprocessor Control Unit 2.6. Functional Blocks of 16 or 32 bit Microprocessor	of the faculty. The lecture slides are available online on the faculty's "Moodle" platform.	6 hrs
3. Fundamentals of a Typical CISC Architecture 3.1. Registers 3.2. Microcomputer Memory Architecture 3.3. Data Transfers 3.4. Addressing Techniques 3.5. Types of Instructions		9 hrs
4. Fundamentals of a Typical RISC Architecture 4.1. Registers 4.2. Instruction Set and Addressing Techniques 4.3. Microprocessor Control Unit 4.4. Software Layer for RISC Architecture		9 hrs
5. Input/Output Strategies 5.1. Input/Output Devices Map 5.2. Typical Input/Output Techniques 5.3. Interrupt System for General Purpose Microprocessor 5.4. Interrupts for x86 Intel Microprocessor (IA-32) in Real Mode		3 hrs
6. Time-Dimension of a General Purpose Microprocessor Architecture 6.1. CISC Instruction Timing 6.2. Speed Increase for Advanced CISC Microprocessor 6.3. RISC Instruction Timing		6 hrs
7. An Overview of Intel x86 Architecture (IA-32) in Real Mode 7.1. Block Diagram 7.2. Registers 7.3. Memory Organization 7.4. Port Organization 7.5. Addressing Modes		3 hrs
Bibliography - C. Burileanu, "Arhitectura microprocesoarelor", Editura Denix, Bucureşti, 1994. - C. Burileanu s.a., "Microprocesoarele x86 – o abordare software", Ed. "Grupul microInformatica", Cluj-Napoca, 1999. - C. Burileanu, Lecture notes, available online on the faculty's „Moodle" platform.		
8.2 Practical applications	Teaching techniques	Remarks
A program development tool for x86 microprocessors: TASMB turbo-assembler and AFD debugger.	The teacher presents briefly the theoretical concepts that will be used in the laboratory, and then guides the students to develop practical applications for the	2 hrs
Data Transfer instructions and sting operations for x86 microprocessors in real mode.		2 hrs

Data processing instructions for x86 microprocessors in real mode.	8086 microprocessor using the emu 8086 simulator. The teaching materials are the laboratory papers.	2 hrs
Control program instructions for x86 microprocessors in real mode.		2 hrs
Interrupts for x86 microprocessors in real mode.		2 hrs
Code translation from high-level languages to assembler language.		2 hrs
Laboratory assessment		2 hrs
Bibliography - C. Burileanu, H. Cucu, Diana Şandru, Laboratory papers, available online on the faculty's „Moodle" platform.		

9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program

The course content is largely similar to that of courses with the same objectives taught in other universities in the European Union. The course content is continually updated and adapted after consultations with representatives from the business environment.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Lectures	- knowledge of fundamental theoretical issues; - solving typical, practical problems	Oral exam in the exam session: - Student's free presentation; - Evaluation discussion; - Oral questioning.	50%
10.5 Practical applications	- designing an algorithm for solving a typical problem; - translating the algorithm in a program written in 8086 assembly language; - demonstrating the correct execution of the 8086 program.	Two equally-graded, multiple choice verification tests (during the semester). Oral final evaluation to asses the implementation, debugging and execution of an application for the 8086 microprocessor.	50%
10.6 Minimal performance standard			
- Knowledge of architectural attributes and addressing modes for microprocessors; - Design, implementation and execution of a program written in 8086 assembly language.			

Date
01.10.2017

Lecturer
Prof. Corneliu Burileanu

Instructor for practical activities
Asist. Diana Şandru

Director of Department,
Prof. Dr. Ing. C. Dan