SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3	Department	Communications
1.4	Field of study	Electronics and Telecommunications Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Telecommunications Technologies and Systems/ Engineer, Applied Electronics/ Engineer
1.7	Form of education	Full time
1.8	Subject code	TST-E33.00, EA-E33.00

2. Data about the subject

2.1	Subject name			Microprocessors			
2.2	Subject area			Telecommunications			
2.3	Course responsible/lecturer			Prof. Mircea Giurgiu, PhD			
2.4	Teachers in charge of applications			Assist. Prof. Adriana Stan, PhD			
2.5 Year of study	3	2.6 Semester	1	2.7 Assessment	Exam	2.8 Subject category	DID/DOB

3. Estimated total time

3.1 Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4 Total hours in the curriculum	130	3.5 of which, course:	28	3.6 applications:	28
Individual study					hours
Manual, lecture material and notes, bibliography					26
Supplementary study in the library, online and in the field					8
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					28
Tutoring					4
Exams and tests					4
Other activities					4

3.7	Total hours of individual study	74
3.8	Total hours per semester	130
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	Digital Integrated Circuits, Computer Programming - Algorithms
4.2	Competence	Computer programming (basics), Digital competences

5. Requirements (where appropriate)

5.1	For the course	Lecture room with video-projector
5.2	For the applications	LAN in the lab room with Internet connection, microprocessor simulator, Assembler/Linker, Debugger.

6. Specific competences

Professional competences	C3. To apply knowledge, concepts and basic methods regarding computing systems' architecture, microprocessors, microcontrollers, programming languages and techniques C4. To design, implement and operate data, voice, video and multimedia services, based on the understanding and application of fundamental concepts from the field of communications and information transmission. C5. To select, install, configure and exploit fixed and mobile telecommunications equipment. To equip a site with common telecommunications networks.
Cross competences	N.A.

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	To acquire knowledge and skills on the hardware designing and on the development of software applications in assembling language for a microprocessor-based system.
7.2	Specific objectives	• to classify the microprocessors and to know their architecture and functional description; • to apply the instruction set in developing applications that include the use of various addressing modes of memory and peripheral devices • to know the interrupt system and to be able to use BIOS/DOS interrupts • to know the signals of the microprocessor and its connection in the system • to develop applications in assembling language • to design a microprocessor-based system by connecting the memory and the peripheral devices. • to be able to use in real applications specific communications protocols used for data transfer

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Basics of microprocessors: von Neumann model, Harvard model, pipelining, features of microprocessors.	PPT presentations, practical demos, interactive discussions and debates, problem solving.	NA
2.	IA-32 Intel architecture and internal architecture of the I80x86 microprocessors.		
3.	Addressing of memory in real mode. Addressing in protected mode.		
4.	Data transfer and arithmetic instructions. Applications.		
5.	Logical instructions and instructions for control flow.		
6.	Instructions on strings of bytes and for I/O devices.		
7.	Procedures and macros. Development of programs in assembling language.		
8.	The interrupt system: the structure of IVT, HW and SW interrupts, changing the IVT, examples.		

9.	BIOS & DOS services. TSR programs. Examples: keyboard, videoscreen, HDD, serial and paralel interface.		
10.	Description of the signals for I80x86 and interfacing with external hardware.		
11.	Basic bus operations. Connection of the microprocessor in the system.		
12.	Principles in designing plugged-in/external I/O hardware interfaces. Designing of the memory blocks.		
13.	80x87 FPU. Functional description, hardware system interface, instruction set.		
14.	High speed communication interfaces: SCSI, USB, I2C.		

Bibliography:

[1] M Giurgiu, "Microprocessors", Lectures notes as PPT slides.

[2] B. B. Brey, "INTEL Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Prentium ProProcessor, Pentium II, III, 4", ed. 8, Prentice Hall, 2008

[3] M.A. Mazidi,S. Naimi, S. Naimi, AVR Microcontroller and Embedded Systems: Using Assembly and C, Prentice Hall, 2010.

[4] Serge Liddin – Inside Microsoft .NET Assembler, Redmond - Washinghton, 2003.

[5] ***, Microprocessors Reference Manual, Intel Corporation, 2004

[6] V. Lungu - Procesoare Intel. Programare in limbaj de asamblare, Ed. Teora, 2000

[7] Gh. Musca, Programarea in limbaj de asamblare, Ed. Teora, Bucuresti, 1998

[8] E.Lupu, A. Mesaros, Microprocessors. Architectures and applications, Ed. Risoprint Cluj-Napoca, 2003

[9] G. Toderean, Limbajul de asamblare x86. Probleme, Ed. Risoprint, 2003

[10] V. Dobrota, s.a, Aplicatii in sisteme cu microprocesoare din familia I80x86, Ed. Terra, 1992

[11] C. Strugaru, Microprocesoare pe 16 biti, Ed. TM Timisoara, 1992

8.2. Applications/Laboratory		Teaching methods	Notes
1.	Presentation of the laboratory and computing facilities.	Individual hands on activities, experiments, following demos, problem-based learning.	N.A.
2.	Representation of information in microcomputers.		
3.	Hands-on microprocessor simulator. Traffic lights controller and other simple applications.		
4.	Addressing modes and internal architecture of 80x86. Hands-on Turbo-debugger.		
5.	Applications with instructions set (I). Data transfer and arithmetic instructions.		
6.	Applications with instructions set (II). Logic instructions and instructions for control flow		
7.	Applications with instructions on strings of bytes. Procedures and macros		
8.	Intermediary evaluation (test)		
9.	Development of programs in assembling language. Using INT 10h and INT 21h.		
10.	Applications using Program Status Prefix (PSP)		
11.	The keyboard programming: installing own interrupt routine. The use of INT 16h. Applications.		
12.	Generation of sound signals using 8253.		

13.	Implement a real time clock using the 8253 and interrupts.		
14.	Synthesis problems, final lab reports.		

Bibliography:

[1] M Giurgiu, "Microprocessors", Laboratory guidelines.

[2] B. B. Brey, "INTEL Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Prentium ProProcessor, Pentium II, III, 4", ed. 8, Prentice Hall, 2008

[3] V. Lungu - Procesoare Intel. Programare in limbaj de asamblare, Ed. Teora, 2000

[4] Gh. Musca, Programarea in limbaj de asamblare, Ed. Teora, Bucuresti, 1998

[5] G. Toderean, Limbajul de asamblare x86. Probleme, Ed. Risoprint, 2003

[6] V. Dobrota, s.a, Aplicatii in sisteme cu microprocesoare din familia I80x86, Ed. Terra, 1992.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Competences acquired will be used in the following COR occupations (Electronics Engineer; Telecommunications Engineer; Electronics Design Engineer; System and Computer Design Engineer; Communications Design Engineer) or in the new occupations proposed to be included in COR (Sale Support Engineer; Multimedia Applications Developer; Network Engineer; Communications Systems Test Engineer; Project Manager; Traffic Engineer; Communications Systems Consultant).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Student performance and deep of knowledge against the defined learning outcomes	Written examination (knowledge and problem solving skills)	50%
Applications	Performance in accuracy and originality of problem solving, experiment running and presentation of results.	Running the experiment, solving the problems, intermediary evaluation, individual work, laboratory reports	50%
10.4 Minimum standard of performance			
Hardware designing and development of software applications in assembling language for a microprocessor-based system.			

Date of filling in	Course responsible	Teachers in charge of applications
01.10.2018	Professor Mircea GIURGIU, PhD	Assist. Prof. Adriana STAN, PhD