SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Electronics, Telecommunications and Information Technology
1.3	Department	Applied Electronics
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
1.7	Form of education	Full time
1.8	Subject code	TST-E109.00

2. Data about the subject

2.1	Subject name					Systems with Microcontrollers					
2.2	Subject area					Eiectronics Engineering and Telecommunications					
2.3	Course responsible/lecturer					Prof.dr.ing. Dorin Petreus					
2.4	Teachers in charge of applications					Assistant Patarau Toma, PhD eng. Assistant Etz Radu, PhD eng.					
2.5	Year of study	III	2.6	Semester	2	2.7	Assessment	Exam	2.8	Subject category	DID/ FAC

3. Estimated total time

Year/ Sem	Subject name	No. Of weeks	Course [hours/week]		Applications [hours/week]		Course [hours/semester]		Applications [hours/semester]		Indiv. study	TOTAL	Credits
				S	L	P		S	L	P			
III/II	Systems with Microcontrollers	14	2		2	1	28		28	14	60	130	5

3.1	Number of hours per week	5	3.2	of which, course	2	3.3	Applications	3
3.4	Total hours in the curriculum	70	3.5	of which, course	28	3.6	Applications	42

Individual study	Hours
Manual, lecture material and notes, bibliography	26
Supplementary study in the library, online and in the field	4
Preparation for seminars/laboratory works, homework, reports, portofolios, essays	26
Tutoring	2
Exams and tests	2
Other activities	-

3.7	Total hours of individual study	60
3.8	Total hours per semester	134
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	N/A
4.2	Competence	Knowledge in digital electronics, general programming

5. Requirements (where appropriate)

5.1	For the course	Amphitheatre, Cluj-Napoca

5.2	For the applications	Laboratory, Cluj-Napoca

6 Specific competences

Professional competences	Theoretical knowledge(what the student must know):	
	Acquired skills (what the student is able to do):	After completing the discipline, the students will be able to: • Know the structures of different types of microcontrollers; • Understand how a microcontroller can be programmed; • Appreciate the advantages of using a microcontroller; • Design a specific application.
	Acquired abilities: (what type of equipment the student is able to handle)	After completing the discipline, the students will be able to: • use the IDE like Keil-uVision ; • program in assembly and C language; • measure the signals supplied by a microcontroller; • use the specific tools of debugging.
	In accordance with Grila1 and Grila2 RNCIS	N.A.
Cross competences (Grila1 and Grila2 RNCIS)		N.A.

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

7.1	General objectives	Developing the competences regarding the use analysis and design of systems with microcontrollers .
7.2	Specific objectives	1. Recognizing and understanding basic concepts specific to systems with microcontrollers. 2.Developing skills and ablilities regarding the theoretical knowledges specific to systems with microcontrollers. 3. Developing skills and abilities fot the use, analysis and (re)design of systems with microcontrollers.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Introduction. Microprocessors and Microcontrollers	Presentation, heuristic conversation, exemplification, problem presentation, teaching exercise,.	Use of .ppt presentation, projector, blackboard
2	8051 Microcontroller Hardware • General description • Internal memory • Stack;		
3	Input/ Output Pins, Ports, and Circuits • Description • Timers and Counters • Functioning modes;		
4	Serial port • Serial port interrupts • Operation modes of the serial port.		
5	Interruts • Description • Types of interrupts • Interrupts control • Interrupts validation • Interrupts priority;		
6	Serial interface • RS232 standard • Description and semnification • Communication lines;		
7	Industrial communications interfaces. • RS485. • RS422• Communications protocols.		
8	Serial communications standards I2C, SPI • Description Circuits • Communications protocols •data transfer writing/reading • Master emitter/receiver • Slave		
9	Converters A/D, D/A • Generators PWM;		
10	Programming uC8051• Assembler •Assembly directives • Programming microcontrollers in C language;		
11	uC8051 instruction set • Addressing modes • Data transfer instructions;		
12	Logical instructions • Logical operations at byte level • Logical operations at bit level • Arithmetic operations • Incrementing, Decrementing • Summation, extract, multiply, divide;		
13	Jump and call opcodes		
14	Real –world interfacing : LCD, ADC, DAC • Recapitulation		
8.2. **Applications** (laboratory)		Teaching methods	Notes
1	Introduction. Lab instrumentation;	Didactic and experimental proof, didactic exercise, team work	Use of laboratory instrumentation, experimental and evaluation boards, computers, white/magnetic board
2	RAM memory testing • Soft delay subroutine		
3	Hard delay subroutine • Working with data tables;		
4	Serial port • Serial interface • Working principles • RS232 communication protocols;		
5	Keyboard types used in microcontroller systems • Subroutines used to command the keyboards;		
6	Displays used in microcontroller systems • Subroutines used to command the displays;		
7	I^2C Interface		
8	LM75 temperature sensor interfacing		
9	Process supervising system;		
10	Extended interrupts system;		
11	External signals processing		
12	DC motor control		
13	Double ramp converter assisted by microcontroller		
14	Lab recovery and finalization of laboratory activity		

Bibliografy:

1. Petreus, D. s.a , Aplicatii cu microcontrolere din familia 8051, Editura Mediamira, Cluj-Napoca, ISBN 973-713-014-7 , 2005; 162 pag.
2. Petreus, D., Microcontrollers System, course slides
3. Ayala J. Keneth, The 8051 Microcontroller –Architecture, Programming, and Applications. West Publishing Company, , 1991, ISBN 0-314-77278-2, 241 pag.
2. Mazidi, M.A, Mazidi J.G. The 8051 Microcontroller and embedded systems, Prentice Hall, 2000, ISBN 0-13-861022.

On-line references
1. www.intel.com, www.philips.com, www.atmel.com;

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. Evaluations

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		The level of acquired theoretical knowledge and practical skills		- Summative evaluation written exam (theory and problems) problem solving (70%) and theoretical subjects (30%).		Exam (E: 0…10 points); Homework (H: 0…10 points);
Applications		The level of acquired abilities		- Continuous formative evaluation - practical lab test		Laboratory (L: 0…10 points);
10.4 Minimum standard of performance						
M = 0.6E + 0.2L + 0.2H. Pass if: E≥4 and L≥4 and M≥4.5						

Date of filling in 1.10.2014

Course responsible
Prof. Petreus Dorin, PhD eng.

Teachers in charge of applications
Assistant Patarau Toma, PhD eng.
Assistant Etz Radu, PhD eng.

Date of approval in the department 1.10.2014

Head of department
Prof. Petreus Dorin, PhD eng.