SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Electronics, Telecommunications and information Technology
1.3 Department	Applied Electronics
1.4 Field of study	Electronic Engineering, Telecommunications and Information Technologies
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Applied Electronics / Engineer
1.7 Form of education	Full time
1.8 Subject code	56.10

2. Data about the subject

2.1 Subject name	Integrated Systems						
2.2 Subject area	Theoretical area Methodological area Analytic area						
2.3 Course responsible	Assist. Prof. Adrian Cătălin TĂUT, Phd. Eng. – adrian.taut@ael.utcluj.ro						
2.4 Teacher in charge with seminar / laboratory / project	Assist. Prof. Adrian Cătălin TĂUT, Phd. Eng.– adrian.taut@ael.utcluj.ro Assist. Prof. Alexandra FODOR, PhD Eng. - alexandra.fodor@ael.utcluj.ro						
2.5 Year of study	IV	2.6 Semester	2	2.7 Assessment	V	2.8 Subject category	DS/DO

3. Estimated total time

3.1 Number of hours per week	5	of which: 3.2 course	2	3.3 seminar / laboratory	3
3.4 To Total hours in the curriculum	70	of which: 3.5 course	28	3.6 seminar / laboratory	42

Distribution of time	hours
Manual, lecture material and notes, bibliography	36
Supplementary study in the library, online specialized platforms and in the field	6
Preparation for seminars / laboratories, homework, reports, portfolios and essays	9
Tutoring	2
Exams and tests	2
Other activities:	-

3.7 Total hours of individual study	55
3.8 Total hours per semester	125
3.9 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 curriculum	Electronic Devices, Electrical Circuits Theory, Signals Theory, Digital Integrated Circuits, Computer Aided Design, Electronic Microsystems Technology

4.2 competence	

5. Requirements (where appropriate)

5.1. for the course	Amphitheatre, Cluj-Napoca
5.2. for the seminars / laboratories / projects	Laboratory, Cluj-Napoca

6. Specific competences

Professional competences	C2. Applying the basic methods for signal acquisition and processing. • C2.3 Use of simulation environments for signal analysis and processing • C2.4 Use of the specific method and tools for signal analysis C3. Application of the basic knowledge, concepts and methods regarding the architecture of computer systems, microprocessors, microcontrollers, languages and programming techniques. • C3.5 Projects involving hardware (processors) and software (programming) components C4. Design and use of low complexity hardware and software applications specific to the applied electronics. • C4.1 To define the concepts, principles and methods used in the fields of computer programming, high-level and specific languages, CAD techniques for making electronic modules, microcontrollers, computer systems architecture, programmable electronic systems, graphics, reconfigurable hardware architectures • C4.5 Design of dedicated equipment in the fields of applied electronics, which use: microcontrollers, programmable circuits or computing systems with simple architecture, including related programs
Cross competences	N.A.

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

7.1 General objective	Developing expertise in simulation and modelling of embedded systems.
7.2 Specific objectives	1 Assimilation of theoretical knowledge on embedded systems simulation. 2. Obtaining skills useful in embedded systems simulation and design.

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
1. Course description. Defining, historical point of view and applications of embedded systems.	Oral presentation, discussions, solved exercises, case study	Power-Point slides, Video-projector presentation
2. Design Constraints in Embedded Systems.		

3. Standards used by Embedded Systems.		
4. Instructions Set Architectures		
5. Internal Processor Design		
6. Input/Output Ports Management		
7. Device Drivers.		
8. Embedded Operating Systems.		
9. Multitasking and Process Management		
10. Middleware and Application Software.		
11. Creating an Embedded System Architecture		
12. Implementation.		
13. Testing		
14.Recapitulation. Preparation for the final exam		
Bibliography 1. Peter Marwedel – Embedded System Design – ISBN 978-0-387-29237-3 (2006) 2. Mark I. Montrose – PCB Design techniques for EMC compliance – ISBN 0-7803-1131-0 (2001); 3. Eric Bogatin, Signal Integrity - Simplified. New York, United States: Prentice Hall, 2008; 4. Roberto Cristi – Modern Digital Signal Processing – ISBN 0-534-40095-7 (2004) 5. Jerry C. Whitaker – The Electronics Handbook - ISBN 0-8493-8345-5 (2004) 6. Alin Grama, ”Sisteme integrate – notițe de curs”, www.ael.utcluj.ro		
8.2 Seminar / laboratory / project	Teaching methods	Notes
1. 8/16 bits microcontroller systems – getting started, software editor, compilation, running the software, debuggin	Didactic and experimental proof, case study, teamwork	Use of laboratory instrumentation, experimental boards, laboratory computers, white/magnetic board
2. 8/16 bits microcontroller systems – I/O operations, internal Analog-to-Digital Convertor, PWM generatio		
3. 8/16 bits microcontroller systems – communications interfaces		
4. Sensors, actuators, mechatronics systems modeling		
5. Software/Hardware tests for embedded systems		
6. PCB prototype technology		
7. Assembly and test of electronic boards		
Bibliography 1. Peter Marwedel – Embedded System Design – ISBN 978-0-387-29237-3 (2006) 2. Mark I. Montrose – PCB Design techniques for EMC compliance – ISBN 0-7803-1131-0 (2001); 3. Eric Bogatin, Signal Integrity - Simplified. New York, United States: Prentice Hall, 2008; 4. Roberto Cristi – Modern Digital Signal Processing – ISBN 0-534-40095-7 (2004) 5. Jerry C. Whitaker – The Electronics Handbook - ISBN 0-8493-8345-5 (2004) 6. Alin Grama, ”Sisteme integrate –notițe de curs”, www.ael.utcluj.ro		

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

The discipline content and the acquired skills are in agreement with the expectations of the professional organizations and the employers in the field, where the students carry out the internship stages and/or occupy a job (in the field of research and electric circuit design, schematic integrator), and the expectations of the national organization for quality assurance (ARACIS).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The level of acquired theoretical knowledge and practical skills	3 Summative evaluation written exam (theory and problems)	30%
10.5 Seminar/ Laboratory	The level of acquired knowledge and abilities	Continuous formative evaluation semester project	70%

10.6 Minimum standard of performance

Quality Level:

Minimum knowledge:

- ✓ Knowledge of the main design constraints in embedded systems.
- ✓ Knowledge of designing a device driver for embedded systems.
- ✓ Knowledge of designing a cooperative and non-cooperative embedded operating system.
- ✓ Knowledge of the techniques used in multitasking and process management in embedded systems.

Minimum competences:

- ✓ Can describe the main design constraints for an embedded real time operating system.
- ✓ Can describe the main steps in designing a device driver for embedded systems.
- ✓ Can characterize the principles behind implementing a cooperative and non-cooperative embedded real time operating system.
- ✓ Can exemplify how to handle multitasking and process management in embedded real time operating systems.

Quantitative level:

- ✓ Attend to all laboratory sessions
- ✓ The written exam and laboratory project marks must be greater or equal to 5.
- ✓ The mark will be computed using the following equation: 0.3*Exam_mark + 0.7*Laboratory_mark

Date of filling in:	Responsible	Title Surname NAME	Signature
23.06.2023	Course	Assist. Prof. Adrian Cătălin TĂUT, Phd. Eng.	
	Applications	Assist. Prof. Adrian Cătălin TĂUT, Phd. Eng.	
		Assist. Prof. Alexandra FODOR, PhD Eng.	

Date of approval in the Department of Applied Electronics 30.06.2023	Head of Department Prof. Dorin PETREUȘ, PhD Eng.
Date of approval in the Council of Faculty of Electronics, Telecommunications and Information Technology 12.07.2023	Dean Prof. Ovidiu Aurel POP, PhD Eng.