Syllabus

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Automation and Computer Science
1.3 Department	Automation
1.4 Field of study	Systems Engineering
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Automation and Applied Informatics (English)
1.7 Form of education	Full time
1.8 Course cod	18.00

2. Data about the subject

2.1 Subject name	***Digital Electronics***				
2.2 Course responsible/lecturer	Sl. Dr. Ing. Gabriel Harja – Gabriel.Harja@aut.utcluj.ro				
2.3 Teachers in charge of applications	Sl. Dr. Ing. Gabriel Harja – Gabriel.Harja@aut.utcluj.ro				
2.4 Year of study	2	2.5 Semester	1	2.6 Assessment *(E/C/V)*	E
2.7 Type of subject	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DD
	DI – compulsory, DO – elective, DFac – optional				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminar	0	Laboratory	2	Project	0
3.2 Number of hours per semester	56	of which:	course	28	Seminar	0	Laboratory	28	Project	0
3.3 Individual study										
(a) Manual, lecture material and notes, bibliography										23
(b) Supplementary study in the library, online and in the field										17
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										17
(d) Tutoring										6
(e) Exams and tests										6
(f) Other activities:										0

3.4 Total hours of individual study (sum of (3.3(a)…3.3(f)))	69
3.5 Total hours per semester (3.2+3.4)	125
3.6 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	Mathematical Analysis, Fundamentals of Electronic Circuits, Computer Programming
4.2 Competence	Basic electronics circuits, computer operating, differential equations

5. Requirements (where appropriate)

5.1. For the course	To be admitted to the assessment, a student must accumulate a minimum lecturer attendance of 70%.
5.2. For the applications	Presence at laboratory is conditioned by forward laboratory report sustain and analysis.

6. Specific competences

6.1 Professional competences	• **C2 –** Operating with basic concepts of computer science, information technology and communication ○ **C2.1 –** Describing the structure and operation of computer systems, communication networks and their applications in systems engineering using the concepts of programming languages, software environments and technologies, software engineering and specific tools (algorithms, diagrams, models, protocols, etc.). ○ **C2.2** – Well-grounded usage of concepts from informatics and computer technology in solving well defined problems of system engineering and in applications requiring the use

	of hardware or software in industrial systems or information technology systems. ○ **C2.3** – Solving common problems of systems engineering using the computer science and information technology concepts for the use of dedicated software tools and computer aided design (CAD) and for the adaptation and extension of these. ○ **C2.4** – Selection and evaluation, as a user, of dedicated software and computer aided design (CAD) tools for applications in systems engineering, computers, information technology and communications. ○ **C2.5** – Using hardware - software code sign and software engineering as development methodologies, including the system level modelling.
6.2 Cross competences	

7. Course objectives

7.1 General objective	Assimilation of knowledge about fundamental concepts of impulse technique, completion and operation of digital circuits, a semiconductor memory, reconfigurable circuits, and microcontrollers.
7.2 Specific objectives	• Design and completion schemes with digital circuits • Design and completion of some application with microcontrollers

8. Contents

8.1 Lecture	No.hours	Teaching methods	Notes
C1. Introductive notions. Definition of the pulse signal, parameters, impulse generation.	2	Slides presentation, explanations and demonstrations on whiteboard, discussions / or online on MS Teams platform	
C2. Switching regime of semiconductor devices.	2		
C3. Integrated logic circuits. Generalities, technical considerations, classification, evolution of integrated logic circuits. Classification of families of logic circuits.	2		
C4. Static parameters of logic circuits: the transfer characteristic, the noise margin, duty factor. Dynamic parameters: propagation delay time, power dissipation.	2		
C5. TTL logic integrated circuits. TTL basic Gate, operating, parameters.	2		
C6. Standard TTL series, parameters, interconnection rules. Open collector TTL circuits, three states circuits (TSL).	2		
C7. TTL circuits series: high speed TTL series (HTTL), low power TTL series (LTTL), Schottky TTL series (STTL, LSTTL), advanced Schottky series (ALS, AS).	2		
C8. Integrated MOS logic circuits. CMOS integrated inverter, static and dynamic parameters.	2		
C9. Series of CMOS circuits. Circuits for protection, buffering circuits, quality factor. Interconnection of integrated logic circuits.	2		
C10. Semiconductor memories. Overview, classifications. ROM Memories.	2		
C11-12. SRAM memories. DRAM memories.	4		
C13-14. Microcontrollers.	4		

Bibliography

1. I. Naşcu (2002): Digital circuits. Editura Mediamira, Cluj Napoca.
2. I. Naşcu, V. Dădârlat, S. Folea, (1996): Digital circuits. Application guide.
3. Dadarlat V., Peculea A.,(2006) Analog and digital circuits. Cluj Napoca
4. Ardelean I., și colectivul (1986): CMOS integrated circuits, E.T. Bucuresti.
5. Stojanov I (1987): From TTL gate to microprocessor. E.T. Bucuresti.
6. David J. Comer, Donald Corner, Fundamentals of Electronic Circuit Design, Wiley, 2003
7. Anant Agarwal, Jefrey H. Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers, 2005

8.2 Applications (seminar/laboratory/project)		No.hours	Teaching methods	Notes
1	Basic concepts in microcontroller programming	2	Application implementation and testing on laboratory didactic stands. Application presenting, explanations and demonstrations on whiteboard, discussions / or online on MS Teams platform	Mandatory attendance
2	Digital inputs/outputs	2		
3	Digital inputs/outputs	2		
4	BCD Display 7 Segments	2		
5	Timer Modules	2		
6	Timer Modules - Interrupts	2		
7	External Interrupts and Input Capture	2		
8	PWM modules	2		
9	Analog-Numeric Converter	2		
10	Basic Logic Circuits	2		
11	Memory circuits	2		
12	Open Collector Logic Circuits	2		
13	Astable circuits	2		
14	Optoelectronic Displays	2		

Bibliography

1. I. Naşcu, V. Dădârlat, S. Folea, (1996): Circuite numerice. Îndrumător de laborator.
2. G.Harja, I. Naşcu, (2018): Circuite numerice. Îndrumător de laborator.

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

Lectures and applications content was discussed with field experts. Over the years the course was favorably assessed by various rating agencies: National Council for Academic Evaluation and Accreditation, Romanian Agency for Quality Assurance in Higher Education.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Theory and problems questions	Written exam / online exam using MS Teams	60%
Laboratory	Application and result presenting	Oral exam / online exam using MS Teams	40%

Minimum standard of performance:
Development of a minimal set of applications using semiconductor memories, reconfigurable circuits, and microcontrollers.

Date of filling in:		**Title Firstname NAME**	**Signature**
	Course	SL. Dr. Ing. Gabriel Harja	
	Applications		

Date of approval by the Department Board ……. _____	Head of Department ..... Prof.dr.ing. Honoriu VĂLEAN
Date of approval by the Faculty Council …… _____	Dean Prof.dr.ing. Liviu Cristian MICLEA