SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Computer science / Engineer
1.7 Form of education	Full time
1.8 Subject code	17.00

2. Data about the subject

2.1 Subject name	*Analog and digital circuits*					
2.2 Course responsible / lecturer	Assoc. prof. dr. eng. Bogdan Iancu - Bogdan.Iancu@cs.utcluj.ro					
2.3 Teachers in charge of seminars / laboratory / project	Prof. dr. eng. Dădârlat Vasile Teodor - Vasile.Dadarlat@cs.utcluj.ro Assoc. prof. dr. eng. Peculea Adrian - Adrian.Peculea@cs.utcluj.ro					
2.4 Year of study	II	2.5 Semester	3	2.6 Type of assessment (E - exam, C - colloquium, V - verification)		E
2.7 Subject category	*DF – fundamentală, DD – în domeniu, DS – de specialitate, DC – complementară*					DD
	DI – Impusă, DOp – opțională, DFac – facultativă					DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminars		Laboratory	2	Project	
3.2 Number of hours per semester	56	of which:	Course	28	Seminars		Laboratory	28	Project	

3.3 Individual study:	
(a) Manual, lecture material and notes, bibliography	10
(b) Supplementary study in the library, online and in the field	12
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	2
(e) Exams and tests	6
(f) Other activities:	0

3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	44
3.5 Total hours per semester (3.2+3.4)	100
3.6 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	
4.2 Competence	Basic knowledge in Physics, Electronics, Mathematics

5. Requirements (where appropriate)

5.1. For the course	Blackboard, projector, computer
5.2. For the applications	Classroom, PC with internet access, specific software, test boards, multimeters, voltage sources, signal generators, oscilloscopes, Arduino compatible development kits. Laboratory attendance is mandatory.

6. Specific competence

6.1 Professional competences	**C2:** Designing hardware, software and communication components **C2.1:** Describing the structure and functioning of computational, communication and software components and systems
	• **C2.2:** Explaining the role, interaction and functioning of hardware, software and communication components
	• **C2.3:** Building the hardware and software components of some computing systems using algorithms, design methods, protocols, languages, data structures, and technologies
	• **C2.4:** Evaluating the functional and non-functional characteristics of the computing systems using specific metrics
	• **C2.5:** Implementing hardware, software and communication systems
6.2 Cross competences	N/A

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

7.1 General objective	Teamwork, understanding of basic digital electronics principles
	The main objective is to provide specific information and to prepare students for projects using discrete electronic devices and analog and digital integrated circuits. Thus, ADC will offer students the capacity to analyse, design and implement electronic systems
7.2 Specific objectives	Each student able to understand the functionality for the main circuits from a motherboard
	Theoretical knowledge on discrete electronic devices
	Skills in designing and implementing devices using discrete electronic devices
	Theoretical knowledge on analog integrated circuits
	Skills in designing and implementing devices using analog integrated circuits
	Theoretical knowledge on digital integrated circuits
	Skills in designing and implementing devices using digital integrated circuits

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Introduction. Electrical signals, passive devices, linear circuits behavior at elementary signals application.	2	Oral Presentations using multimedia means Q & A Interactive teaching	
Semiconductor devices (I). Semiconductor, Schottky, Zener and light emitting diode.	2		
Semiconductor devices (II). Bipolar and field effect transistor.	2		
Operational amplifiers. Characteristics, circuits with operational amplifiers with negative feedback.	2		
DC power supplies. Rectifiers, filters. Parametric, feedback and integrated voltage regulators. Oscillators. Positive feedback, oscillator circuits.	2		
Integrated logic circuit parameters. Static transfer characteristics, noise margins, fan-in and fan-out, propagation time, power dissipation.	2		
Integrated logic circuit families (I). TTL integrated logic circuits.	2		
Integrated logic circuit families (II). NMOS, CMOS and HCT integrated logic circuits.	2		
Bus building with logic circuits. Open collector and three state integrated logic circuits, connecting circuits to buses, transfer between registers and three state logic.	2		
Positive feedback circuits (I). Schmitt trigger and flip-flop circuits.	2		
Positive feedback circuits (II). Monostable and astable circuits.	2		
Semiconductor memories. Volatile and non-volatile semiconductor memories.	2		

Converters. Sampling, signal quantization, analog to digital and digital to analog converters.	2		
Microcontrollers. Architecture, memory addressing, interrupt and timer system, serial communication.	2		

Bibliography
1. Vasile Teodor Dadarlat, Adrian Peculea, „Circuite analogice si numerice", Ed. U.T.PRES, Cluj-Napoca, 2006, ISBN
2. Slides for Analog and digital circuits courses + sets of problems and applications for individual study at https://moodle.cs.utcluj.ro/

8.2 Applications - Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Linear circuits with RC elements	2	Practical exercises Brief presentation of possible solutions Self testing programmes. Q & A	
Rectifiers	2		
Continuous voltage sources	2		
Inverter with bipolar transistors	2		
TTL logic circuits	2		
NMOS integrated circuits			
CMOS integrated circuits	2		
CMOS transmission gate	2		
Bus design using open collector logic and three state circuits	2		
Measurements using multimeters	2		
RC filters - practical assembly	2		
The study of bipolar transistors - practical assembly	2		
Introduction to Arduino	2		
Laboratory test	2		

Bibliography
1. Slides for Analog an digital circuits courses + sets of problems and applications for individual study at ftp://ftp.utcluj.ro/pub/users/dadarlat/circ_analognumeric-calc
2. https://moodle.cs.utcluj.ro/
3. Adrian Peculea, Bogdan Iancu, Vasile Dadarlat, Sorin Buzura, "Analog and digital Circuits.Practical applications", ISBN 978-606-737-459-9, U.T. Press Cluj-Napoca, 2020

*Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.

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

Course content is kept state of the art by using latest technologies and devices available on the market. The discipline is important for design using discrete electronic devices, and analog and digital integrated circuits. The content of the discipline was discussed with important actors in this field, both academic and industrial, from Romania, Europe and the USA. Discipline was evaluated and certified by ARACIS.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Interactivity and initial preparation, attendance, activity during lectures, examinations	Written and / or oral exam	60%
Seminar	-	-	-
Laboratory	Interactivity and initial preparation, quality of practical work, ability to solve problems specific to the field, attendance, activity during classes	Continuous assessment, final test, written and / or oral	40%
Project	-	-	-

Minimum standard of performance: Design of electronic systems using discrete devices and analog and digital integrated circuits.
Grade calculus: 40% laboratory + 60% final exam
Conditions for participating in the final exam: Laboratory ≥ 5 Conditions
for promotion: grade ≥ 5

Date of filling in: 03.06.2024	Teachers	Title First name Last name	Signature
	Course	Assoc.prof.dr.eng. Bogdan Iancu	
	Applications	Prof.dr.eng. Dădârlat Vasile-Teodor	
		Assoc.prof.dr.eng. Adrian Peculea	

Date of approval in the department 20.02.2024	Head of department, Prof.dr.eng. Rodica Potolea
Date of approval in the Faculty Council 22.02.2024	Dean, Prof.dr.eng. Mihaela Dînșoreanu