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	Bases of 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	Telecommunications Technologies and Systems/Applied Electronics / Engineer
1.7 Form of education	Full time
1.8 Subject code	12.00

2. Data about the subject

2.1 Subject name	Electronic devices						
2.2 Subject area	Electronic devices and circuits						
2.3 Course responsible/lecturer	Assist.prof. Laura-Nicoleta IVANCIU, PhD laura.ivanciu@bel.utcluj.ro						
2.4 Teachers in charge of applications	Assist.prof. Laura-Nicoleta IVANCIU, PhD laura.ivanciu@bel.utcluj.ro Assoc.prof. Emilia ȘIPOS, PhD emilia.sipos@bel.utcluj.ro						
2.5 Year of study	I	2.6 Semester	2	2.7 Assessment	E	2.8 Subject category	DD/DI

3. Estimated total time

3.1 Number of hours per week	4	of which : 3.2 course	2	3.3 seminar / laboratory	2
3.4 Total hours in the curriculum	56	of which: 3.5 course	28	3.6 seminar / laboratory	28
Distribution of time					hours
Manual, lecture material and notes, bibliography					35
Supplementary study in the library, online specialized platforms and in the field					-
Preparation for seminars / laboratories, homework, reports, portfolios and essays					28
Tutoring					3
Exams and tests					3
Other activities:					

3.7 Total hours of individual study	69
3.8 Total hours per semester	125
3.9 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	Passive Components and Circuits, Physics

4.2 Competence	Electrical signals, connection of passive components, relations and theorems for electric circuits, time and frequency behavior of capacitors and inductors, frequency response representation.

5. Requirements (where appropriate)

5.1. For the course	
5.2. For the laboratories	

6. Specific competences

Professional competences	C1. To use the fundamental elements regarding electronic devices, circuits, systems, instrumentation and technology C4. To design and use low complexity hardware and software applications, specific to applied electronics C5. To apply knowledge, concepts and basic methods from power electronics, automated systems, electric energy management, electromagnetic compatibility
Cross-competences	

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

7.1 General objectives	Developing the competences regarding the use of electronic devices.
7.2 Specific objectives	1. Recognizing and understanding basic concepts specific to electronic devices. 2. Developing skills and abilities necessary for the use of electronic devices in simple electronic circuits 3. Developing skills and abilities for the analysis and (re)design of electronic circuits.

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
1. Presentation of course structure. Review: electrical signals, relations and theorems for electric circuits, RC circuits, frequency response representation	Presentation, euristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation	.Use of .ppt presentation, projector, blackboard
2. Diodes. Models for switching diode. DR circuits.		
3. DC switching circuits. Single-phase rectifiers with capacitive filter.		
4. Diodes in permanent conduction. The exponential model. Analysis of DR circuits. Zener diodes. LEDs.		
5. Operational amplifiers (OpAmps). OpAmp operation. Ideal OpAmp. Modes of use.		
6. Simple op-amp comparators. Inverting and noninverting comparators. Voltage transfer characteristic. Waveforms.		
7. Positive feedback OpAmp comparators. Inverting and noninverting comparators. Voltage transfer characteristic. Waveforms.		
8. Electronic amplifiers: definition, power supply, voltage transfer characteristic, modeling, performance evaluation. Negative		

feedback op-amp amplifiers. Non-inverting and inverting amplifier.		
9. Summing amplifiers. Differential amplifiers.		
10. Applications with OpAmp: voltage domain conversion circuits, capacitively coupled amplifiers, amplifiers operated from a single power supply, integrators and differentiators.		
11. Transistors. Types. Operating principle and operating regions. Use in circuits. Transfer characteristics. BJTs: symbol, internal structure		
12. BJTs operating principle and equations, transistor characteristics, operating regions, saturation. Switching MOS transistor: analog switch, CMOS inverter. Noise margins.		
13. MOS transistors: symbol, physical structure, operating principle and equations, static characteristics, operating regions.		
14. Recapitulation. Preparation for the final exam.		
8.2 Laboratory	Teaching methods	Notes
1. Introduction. Workplace safety.	Didactic and experimental proof, didactic exercise, team work	Use of laboratory instrumentation, experimental boards, computers, smart board
2. Lab instrumentation. Voltage divider.		
3. Semiconductor diodes		
4. DR switching circuits, two-port and multi-port networks		
5. DC switching two-port network		
6. Single phase rectifiers with capacitive filter		
7. Circuits with Zener diodes and LEDs.		
8. Voltage comparator with op-amp - simple comparators		
9. Optical indicator for voltage level with OpAmp		
10. Voltage comparator with op-amp - hysteresis comparators		
11. Basic amplifiers with OpAmp		
12. Rail-to-rail OpAmp amplifier with unipolar supply		
13. Laboratory test		
14. Lab do-overs and finalization of lab activity		

Bibliography

On-line references

1. Ivanciu, Laura-Nicoleta. Electronic devices (course slides, laboratories, problem examples, exam subjects), http://www.bel.utcluj.ro/dce/didactic/ed/
2. Ivanciu, Laura, Sipos, Emilia, Electronic Devices, UTPress, Cluj-Napoca, ISBN 978-606-737-639-5, 2023
3. Sipos, Emilia, Ivanciu, Laura, Dispozitive Electronice. Probleme rezolvate, 2016
4. Ivanciu, Laura, Sipos, Emilia, Electronic Devices Laboratory Manual , Editura UTPRESS, Cluj Napoca, 2022, ISBN 978-606-737-579-4

Offline references

1. Emilia ȘIPOȘ, Laura IVANCIU, Dispozitive electronice, Cluj-Napoca, editura UTPRESS, ISBN 978-606-737-576-3, 2022, 250 pag.
2. Oltean, G., Dispozitive și circuite electronice. Dispozitive electronice, Editura Risoprint, Cluj-Napoca, ISBN 973-656-433-9, 2003, retipărită 2004, 316 pag.
3. Oltean, G., Şipos, Emilia, Miron, C., Ivanciu, Laura, Dispozitive electronice. Îndrumător de laborator, Cluj-Napoca, U.T. Press, ISBN 978-973-662-541-1, 105 pag, 2010.
4. Miron,C., Oltean, G., Gordan, Mihaela, Dispozitive și circuite electronice, Culegere de probleme, Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 1999.
5. Mircea Ciugudean, Proiectarea unor circuite electronice, Ed.Facla, Timisoara, 1983
6. Thomas Floyd, Dispozitive electronice, Ed. Teora, 2007
7. Boylestad Robert L., Electronic Devices and Circuit Theory

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 Electronics), and the expectations of the national organization for quality assurance (ARACIS).

10. Evaluations

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	- 10 homework activities - optional (problem solving) - Summative evaluation written exam (problem solving)	70%
10.5 Applications	The level of acquired abilities	- Continuous formative evaluation - Laboratory test (practical evaluation)	30%

10.6 Minimum standard of performance

Qualitative level:

Minimum knowledge:

1. Knowing the operating principle of RC circuits, in time and frequency domain
2. Knowing the operating principle of diodes and diode circuits
3. Knowing the operating principle of operational amplifiers
4. Knowing the operating principle of BJTs and MOSFETs

Minimum competencies:

1. To be able to determine the performance of simple circuits with electronic devices
2. To be able to use electronic devices in switching or permanent conduction regime
3. To be able to use the lab instrumentation and experimental boards.

Quantitative level:

1. Full laboratory attendance
2. Minimum grade for exam and lab - 5
3. Final grade computed as: Grade = 0.7*Exam + 0.3*Lab

Date of filling in:	Responsible	Title Surname NAME	Signature
20.06.2023	Course	Assist.prof. Laura-Nicoleta IVANCIU, PhD eng.	
	Applications	Assist.prof. Laura-Nicoleta IVANCIU, PhD eng.	
		Assoc.prof. Emilia ȘIPOȘ, PhD eng.	

Date of approval in the Department of Bases of Electronics 11.06.2023	Head of Bases of Electronics Department Prof. Sorin HINTEA, PhD eng.
Date of approval in the Council of Faculty of Electronics, Telecommunications and Information Technology 12.03.2023	Dean Prof. Ovidiu POP, PhD eng.