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	Electronics and Telecommunications Engineering
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	20.00

2. Data about the subject

2.1	Subject name			Fundamental Electronic Circuits			
2.2	Subject area			Electronic Devices and Circuits			
2.3	Course responsible/lecturer			Prof. Gabriel OLTEAN, PhD			
2.4	Teachers in charge of applications			Assist.prof. Laura IVANCIU, PhD Assoc.prof. Emilia ȘIPOS, PhD			
2.5 Year of study	II	2.6 Semester	1	2.7 Assessment	Exam	2.8 Subject category	DID/DI

3. Estimated total time

3.1 Number of hours per week	5	3.2 of which, course:	2	3.3 seminar/lab	1/2
3.4 Total hours in the curriculum	125	3.5 of which, course:	28	3.6 seminar/lab	42
Individual study					hours
Manual, lecture material and notes, bibliography					21
Supplementary study in the library, online and in the field					-
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					28
Tutoring					3
Exams and tests					3
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	

4.2	Competence	Relations and theorems for electric circuits, frequency response representation; operating principles for electronic devices: diode, operational amplifier, MOSFET and BJT transistors; use of electronic devices in electronic circuits; analysis methods for electronic circuits; voltage transfer characteristics; transfer function.

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	

6. Specific competences

Professional competences	According to the RNCIS grid: C1. Use of the fundamental elements related to the devices, circuits, systems, instrumentation and electronic technology C2. Application of basic methods for signals acquisition and processing C4. Design and use of low complexity hardware and software applications specific to the applied electronics C5. Application of the basic knowledge, concepts and methods from: power electronics, automatic systems, electricity management, electromagnetic compatibility Other competences: - knowledge of logic circuits with transistors; - knowledge of transistor biasing circuits for transistor amplifiers. - knowledge of small signal models for transistors and amplifiers with transistors (MOS, BJT); - identification of feedback circuits structure, type of feedback, the fundamental equation of the negative feedback; - knowledge of configuration, operating principle and analysis and (re)design methods for fundamental electronic circuits: amplifiers with one transistor, current sources and mirrors, linear voltage regulators, sinusoidal and non-sinusoidal oscillators, power amplifiers, - using of lab instrumentation for the experimental study of electronic circuits; - using of experimental boards; - connecting the lab instrumentation with the experimental boards, in order to experimentally study electronic circuits; - using the computer to the numerical data obtained through the explorations; - storing and analysis the numerical data obtained through the explorations.
Cross competences	

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

7.1	General objective	Developing the competences regarding the use of electronic devices, regarding the use, analysis and (re)design of fundamental electronic circuits.
7.2	Specific objectives	1. Understanding the operating principles of the fundamental electronic circuits 2. Recognizing and understanding basic concepts specific to fundamental electronic circuits. 3. Developing skills and abilities necessary for the use of electronic circuits 4. Developing skills and abilities for the analysis and (re)design of electronic circuits.

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
1. Introduction. Course presentation. Transistor circuits	Presentation, heuristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation	Use of .ppt presentation, projector, blackboard
2. Transistor digital circuits. Transistor amplifiers. DC biasing in active region		
3. Biasing BJT and MOSFET in the active region		
4. MOSFET small-signal model and parameters. MOSFET basic amplifiers		
5. BJT small-signal model and parameters. BJT basic amplifiers		
6. Frequency response: CS and CE. Current sources and current mirrors with MOSFET and BJT		
7. Power amplifiers. Class A, B and AB. Power amplifiers		
8. Feedback circuits. Feedback configurations. Negative feedback effects over an amplifier parameters		
9. DC voltage regulators. Linear voltage regulators with op amp. Over - current and short - circuit protection.		
10. Integrated voltage regulators. The 723 voltage regulator. Switching voltage regulators.		
11. Sinusoidal oscillators. Op – amp and Wien bridge oscillators. Automatic control of the amplitude.		
12. Nonsinusoidal oscillators. Astable multivibrators. LM555 timer.		
13. Class D power amplifier. Operating principle. PWM generator. Power stage. Low – pass filter.		
14. Recapitulation. Exam preparation		
8.2. Applications/Seminars	Teaching methods	Notes
Laboratory	Didactic and experimental proof, didactic exercise, teamwork	Use of laboratory instruments, experimental boards, computers,
Introduction. Safety at work		
Collecting experimental data using the computer		
MOSFET logic circuits		
Single-stage BJT amplifiers. CE configuration		
Single-stage BJT amplifiers. CC, CB configurations		

Class B power amplifiers		smart board, blackboard
Negative feedback effects on an amplifiers		
LM7805 voltage regulator		
DC – DC converter		
Multivibrator circuits using the 555 timer		
Sinusoidal oscillator		
Laboratory test		
Function generator		
Concluding laboratory		
Seminars		
Logic circuits with transistors. DC equivalent circuit - OP		
Basic amplifiers with MOSFET		
Basic amplifiers with BJT. Current sources		
Power amplifiers. NF Circuits		
DC voltage regulators		
Sinusoidal oscillators		
Nonsinusoidal oscillators. Recap		

Bibliography

1. Emilia ȘIPOȘ, Laura IVANCIU, Dispozitive electronice, Cluj-Napoca, editura UTPRESS, ISBN 978-606-737-576-3, 2022
2. Oltean, G., Circuite Electronice, UT Pres, Cluj-Napoca, ISBN 978-973-662-300-4, 203 pag., 2007
3. Sedra, A. S., Smith, K. C., Microelectronic Circuits, Fifth Edition, Oxford University Press, ISBN: 0-19-514252-7, 2004.
4. Mircea Ciugudean, Proiectarea unor circuite electronice, Ed.Facla, Timisoara, 1983
5. Thomas Floyd, Dispozitive electronice, Ed. Teora, 2007
6. Boylestad Robert L., Electronic Devices and Circuit Theory

On – line references

1. Oltean, G, Fundamentals of Electronic Circuits, on-line: http://www.bel.utcluj.ro/dce/didactic/fec
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. Paul Falstad, Circuit Simulator, https://www.falstad.com/circuit/

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, and the expectations of the Romanian Agency 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 theoretical knowledge and practical skills acquired for the analysis and (re)design of electronic circuits	- Written exam: problem solving	60%

10.5 Lab	The level of the abilities acquired for experimental analysis of electronic circuits	- Continuous formative evaluation - Lab test	20%
10.5 Seminar	The level of the abilities acquired for problem solving	- Continuous formative evaluation	20%

10.6 Minimum standard of performance

Qualitative level:

Minimum knowledge:

1. Transistor circuits
2. Transistor biasing circuits for transistor amplifiers
3. Small-signal models of transistors and transistor amplifiers
4. Feedback circuits, equation of negative feedback circuits
5. Structure, operating principle and analysis of fundamental electronic circuits: fundamental amplifiers with transistors, logic circuits with transistors, current sources and current sinks, linear voltage regulators, sinusoidal and nonsinusoidal signal generators, power amplifiers
6. Design and redesign fundamental electronic circuits

Minimum competencies:

1. To be able to determine the performance of electronic circuits
2. To be able to use, design and redesign fundamental electronic circuits
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 = 0.6*Exam + 0.2*Lab + 0.2*Seminar

Data of filling in:	**Responsible**		**Signature**
20.06.2023	Course	Prof. Gabriel OLTEAN, PhD	
	Applications	Assist.prof. Laura IVANCIU, PhD	
		Assoc.prof. Emilia ȘIPOS, PhD	

Date of approval in the department 11.07.2023	Head of department Prof. Sorin HINTEA, PhD
Date of approval in the council of the faculty 12.06.2023	Dean Prof. Ovidiu POP, PhD