SYLLABUS

1. Program Information

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Department of Automation
1.4 Field of study	Automation, Applied Informatics and Intelligent Systems
1.5 Cycle of studies	Bachelor
1.6 Study Programme/Qualification	Intelligent Automation Systems (dual, in English language)
1.7 Form of education	IF – full-time education
1.8 Course code	2.00

2. Course information

2.1 Course title	**Fundamentals of Electronic Circuits**					
2.2 Course lecturer	*Assoc. Prof. Iulia Clitan, Ph.D, Iulia.Clitan@aut.utcluj.ro*					
2.3 Seminar / Laboratory / Project Lecturer	*Assoc.Prof. Iulia Clitan, Ph.D, Iulia.Clitan@aut.utcluj.ro* *Ing. Adrian Mudure (Emerson)* *Ing. Dumitru Tomoiaga (Emerson)*					
2.4 Year of study	1	2.5 Semester	1	2.6 Type of assessment		E
2.7 Course status	Formative category *(DF, DS, DC)*					DF
	Optionality *(DOB, DOP, DFac)*					DOB

3.Total estimated time

3.1 Number of hours per week	4	of which:	HEI	Lecture	2	Seminar	1	Laboratory	0	Project	0
			CO		0		0		1		0
3.2 Number of hours per semester	56	of which:	HEI	Lecture	28	Seminar	14	Laboratory	0	Project	0
			CO		0		0		14		0

3.3 Distribution of time allocation (hours per semester) for:	HEI	CO
(a) Study based on textbook, course support, bibliography, and notes	12	12
(b) Additional documentation in library, specialized electronic platforms, and fieldwork	7	7
(c) Preparation of seminars/laboratories, assignments, papers, portfolios and essays	11	14
(d) Tutoring	1	1
(e) Examinations	2	2
(f) Other activities:	-	-
3.4 Total individual study hours (sum (3.3(a)... 3.3(f)))	33	36
3.5 Total hours per semester (3.3+3.4)	75	50
3.6 Number of credits per semester	3	2

(HEI = Higher Education Institution, CO = Company)

4. Prerequisites (where applicable)

4.1 Curriculum Prerequisites	-
4.2 Competency Prerequisites	Basic knowledge about electrical signals

5. Conditions (where applicable)

5.1. Course Organization Conditions	Onsite at HEI.
5.2. Seminar / Laboratory / Project organization conditions	Onsite at HEI / Onsite at CO/-.

6. Specific Competencies Acquired

Professional Competencies	• PC08 Design automation components • PC10 Develop electronic test procedures • PC20 Record test data • PC25 Use technical drawing software
Transversal Competencies	• TC01 Apply knowledge of science, technology and engineering • TC02 Think analytically

7. Learning outcomes

Knowledge:	The student/graduate describes, identifies, and summarizes concepts and methods related to systems in general, as well as to measurement techniques, electrical and electronic engineering and their application to concrete problems, using specific mathematical and physical tools.
Skills:	• The student/graduate explains the tasks to be solved, argues the solutions in systems engineering based on the principles of mathematics and the laws of physics and uses the basic components in the field and the techniques for measuring electrical and non-electrical quantities. • The student/graduate applies techniques, principles of physics and appropriate mathematical methods to solve common problems in systems engineering, with an emphasis on numerical calculation methods. • The student/graduate selects and applies specific scientific methods and techniques in the development and implementation of projects in the field of electrical systems engineering and analyzes the level of scientific documentation and the potential advantages and disadvantages of the proposed methods and procedures.
Responsibility and autonomy:	• The student/graduate carries out processes in electrical engineering project management, taking on different roles in the team and clearly and concisely describing the results, verbally and in writing.

8. Course Objectives

8.1 General objective of the course	• Developing the competences regarding the use of electronic devices, regarding the use, analysis and (re)design of fundamental electronic circuits.
8.2 Specific objectives	• Recognizing and understanding basic concepts specific to electronic devices and fundamental electronic circuits. • Developing skills and abilities necessary for the use of electronic devices in simple electronic circuits. • Developing skills and abilities for the theoretical and experimental analysis of electronic circuits. Developing skills and abilities necessary for (re)design of electronic circuits.

9. Contents

9.1 Lectures	No. of hours	Teaching methods	Obs.
C1 Introduction. Fundamentals: electrical signals, relations and theorems for electric circuits	2	Slides presentation, explanations and	Use of projector, smart
C2 Introduction. Fundamentals. Active and passive electric circuit elements. RC circuits.	2		

C3 Diodes. Operating principle. Diode-resistor (DR) circuits. DR logic gates.	2	demonstrations on blackboard, discussions	board, blackboard
C4 Zener Diode. Parametric voltage regulator. LED. 7-segment display.	2		
C5 Bipolar Junction Transistor. Thyristor	2		
C6 MOSFET operation as a switch. MOSFET Logic Circuits: NOT, NAND, NOR	2		
C7. Single-phase rectifiers with capacitive filter. 3 phase Rectifier. Wave Controlled Rectifier	2		
C8 Amplifiers. Transistor Amplifier. Operational amplifier (op amp). Ideal op amp	2		
C9. Op-amp comparators. Positive and Negative Voltage comparators. Voltage transfer characteristic. Waveforms.	2		
C10. Op-amp applications: summing amplifiers, differential amplifiers, inverting integrator, Inverting differentiator.	2		
C11. DC voltage regulators. Parametric regulators. Linear voltage regulators with op amp. Integrated voltage regulators	2		
C12. Sinusoidal oscillators. Oscillation criterion. RC oscillators. Filters in time and frequency domains. Wien bridge oscillators.	2		
C13. Nonsinusoidal oscillators. Multivibrators with Monostable, Astable and Bistable	2		
C14 Review. Exam preparation	2		

Bibliography

1. Oltean, G., Electronic Devices, Editura U.T. Pres, Cluj-Napoca, ISBN 973-662-220-7, 2006.
2. Cl. Feştilă, M. Abrudean, E. Dulf, Electronică de putere în automatică, Mediamira, 2004.
3. Cl. Feştilă, E. Szakaks, J. Ciura, Power Electronics in Automatic Control, Ed. Mediamira, Cluj-Napoca, 1999, ISBN 973-9358-26-8.
4. Oltean, G, Fundamentals of Electronic Circuits, on-line: http://www.bel.utcluj.ro/dce/didactic/fec_aai/
5. Lelectronics – Engineering LibreTexts, https://eng.libretexts.org/Bookshelves/Electrical_Engineering/Electronics, last visited: 10.11.2025.

9.2 Seminar / laboratory / project	Hours HEI	Hours CO	Teaching methods	Obs.
Seminar			Didactic and experimental proof, didactic exercise, teamwork	Use of computers, smart board, blackboard, laboratory instrument, experimental boards, electrical circuits' simulators
1. Fundamentals. Series and parallel connections	2	-		
2. Fundamentals. Relations and theorems for electric circuits	2	-		
3. Diode-resistor (DR) circuits. DR Logic	2	-		
4. Bipolar Junction Transistor	2	-		
5. MOSFET. Logic gates	2	-		
6. Single-phase Rectifiers	2	-		
7. Amplifier. Oscillators	2	-		
Laboratory				
1. Electrical diagrams	-	2		
2. Testing electrical diagrams	-	2		
3. Measuring Devices	-	2		
4. Introduction to MultisimLive	-	2		
5. Semiconductor devices. BJT	-	2		

6. Amplifiers	-	2		
7. Oscillators	-	2		

Bibliography

1. Sipos, Emilia, Ivanciu, Laura, Dispozitive Electronice. Probleme rezolvate, U.T. PRESS, ISBN 978-606-737-191-8, 2016;
2. Fiore M. James, Semiconductor Devices - Theory and Application, Online at https://eng.libretexts.org/Bookshelves/Electrical_Engineering/Electronics/Semiconductor_Devices_-_Theory_and_Application_(Fiore)
3. Roberge K. James, Operational Amplifiers: Theory and Practice, Online at https://eng.libretexts.org/Bookshelves/Electrical_Engineering/Electronics/Operational_Amplifiers%3A_Theory_and_Practice_(Roberge)

10. Correlation of course content with the expectations of the epistemic community representatives, professional associations, and major employers in the field related to the program

The discipline content and the acquired skills were discussed with HEI experts and are in agreement with the expectations of the major employers in the field related to the program.

11. Evaluation

Activity Type	Evaluation criteria	Evaluation methods	Weight in final grade
11.1 Lecture	The level of theoretical knowledge and practical skills acquired for the analysis and (re)design of electronic circuits	Written exam: problem solving	40%
11.2 Seminar/ Laboratory/Project	The level of the abilities acquired for problem solving of electronic circuits / The level of the abilities acquired for experimental analysis of electronic circuits /	Problem solving	S - 30% / L - 30%
11.3 Minimum Performance Standard			
Grade ≥ 5			

Date of completion:			Signature
11.11.2025	Lecturers		
	Course	Assoc. prof. Iulia CLITAN	
	Applications	Assoc. prof. Iulia CLITAN	

Date of approval by the Department of Automation Council 24.11.2025 Date of approval by the Faculty of Automation and Computer Science Council 28.11.2025	Director of the Department of Automation Prof.dr.ing. Honoriu VĂLEAN Dean Prof.dr.ing. Vlad MUREȘAN