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 Code	4.00

2. Data about the subject

2.1 Subject name	***Fundamentals of Electronic Circuits***				
2.2 Course responsible/lecturer	Prof. Oltean Gabriel, Ph.D– gabriel.oltean@bel.utcluj.ro				
2.3 Teachers in charge of applications	Assoc.prof.Sipos Emilia, Ph.D – emilia.sipos@bel.utcluj.ro				
2.4 Year of study	I	2.5 Semester	I	2.6 Assessment: *Exam*	
2.7 Type of subject	*DD*				
	DI				

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminar	1	Laboratory	1	Projec t	-
3.2 Number of hours per semester	125	of which:	course	28	Seminar	14	Laboratory	14	Project	-
3.3 Individual study										
(a) Manual, lecture material and notes, bibliography										28
(b) Supplementary study in the library, online and in the field										7
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										28
(d) Tutoring										3
(e) Exams and tests										3
(f) Other activities:										-

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	
4.2 Competence	Basic knowledge about electrical signals, passive electronic components (R, C)

5. Requirements (where appropriate)

5.1. For the course	Onsite, Microsoft Teams
5.2. For the applications	Onsite, Microsoft Teams

6. Specific competences

6.1 Professional competences	C1 - Operating with basic concepts of mathematics, physics, measurement science, mechanical engineering, chemical engineering, electrical engineering in systems engineering C1.1 - Using the concepts, theories and methods of the fundamental sciences of systems engineering in professional communication C1.2 - Explaining the problems to be solved and the argumentation of the solutions in system engineering using the techniques, concepts, and methods of mathematics, physics, technical graphics, electrical engineering, and electronics. C1.3 - Solving common problems of systems engineering by identifying the appropriate techniques, principles, methods, and application of mathematics, with emphasis on numerical methods.

	C1.4 - Assessing the potential, advantages and disadvantages of the methods and procedures of the systems engineering field, the scientific documentation level and the consistency of project applications using mathematical techniques and other scientific methods. C1.5 - Development of projects in the field of systems engineering by selecting and applying mathematical and other scientific methods specific to the field.
6.2 Cross competences	N/A

7. Course objectives

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. Recognizing and understanding basic concepts specific to electronic devices, fundamental electronic circuits. 2. Developing skills and abilities necessary for the use of electronic devices in simple electronic circuits. 3. Developing skills and abilities necessary for the use of electronic circuits. 4. Developing skills and abilities for the theoretical and experimental analysis of electronic circuits. 5. (Re)design of electronic circuits.

8. Contents

8.1 Lecture	No.hours	Teaching methods	Notes
1. Introduction. Fundamentals: electrical signals, relations, and theorems for electric circuits. RC circuits in the time and frequency domains	2	Presentation, heuristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation	Use of .ppt presentation, projector, blackboard
2. Diodes. Operating principle. DR circuits. Single-phase rectifiers with capacitive filter. Logic circuits with DR.	2		
3. Zener Diode. Parametric voltage regulator. LED. 7-segment display.	2		
4. MOSFET Logic Circuits. MOSFET operation as a switch. Logic circuits: NOT, NAND, NOR. Noise margins.	2		
5. Operational amplifier (op amp). Op-amp terminals. Op-amp operation. Ideal op amp. Modes of use.	2		
6. Simple op-amp comparators. Inverting and noninverting comparators. Voltage transfer characteristic. Waveforms.	2		
7. Positive feedback op-amp comparators. Inverting and noninverting comparators. Voltage transfer characteristic. Waveforms	2		
8. Negative feedback op-amp amplifiers. Inverting, noninverting amplifiers: voltage transfer characteristic, waveforms, gain, input, and output resistances.	2		
9. Op-amp applications: summing amplifiers, differential amplifiers, voltage domain conversion circuits.	2		
10. DC voltage regulators. Parametric regulators. Linear voltage regulators with op amp. Increasing the output current. Over - current and short - circuit protection.	2		
11. Integrated voltage regulators. The 723-voltage regulator. Three – terminal fixed regulator. Switching voltage regulators.	2		
12. Sinusoidal oscillators. Oscillation criterion. RC oscillators. Op – amp and Wien bridge oscillators.	2		

Automatic control of the amplitude. Op amp and RC ladder network oscillator.			
13. Nonsinusoidal oscillators. Astable multivibrators. Astable multivibrator with one op – amp. Astable multivibrator with an integrator and a comparator. Quartz – crystal clock generator. LM555 timer.	2		
14. Recapitulation. Exam preparation	2		

Bibliography

1 Oltean, G., Electronic Devices, Editura U.T. Pres, Cluj-Napoca, ISBN 973-662-220-7, 2006; 317 pag.
2. Oltean, G., Circuite electronice, UT Pres, Cluj-Napoca, 2007, ISBN 978-973-662-300-4, 203 pag.
3. Sipos, Emilia, Ivanciu, Laura, Dispozitive Electronice. Probleme rezolvate, U.T. PRESS, ISBN 978-606-737-191-8, 2016;
4. Sedra, A. S., Smith, K. C., Microelectronic Circuits, Fifth Edition, Oxford University Press, ISBN: 0-19-514252-7, 2004.
5. Oltean, G, Fundamentals of Electronic Circuits, on-line: http://www.bel.utcluj.ro/dce/didactic/fec_aai/

8.2 Applications (seminar/laboratory/project)	No.hours	Teaching methods	Notes
SEMINARS		Didactic and experimental proof, didactic exercise, teamwork	Use of laboratory instruments, experimental boards, computers, smart board, blackboard
1. Fundamentals	2		
2. Diodes	2		
3. MOSFET logic circuits. 7-segment display	2		
4. Op-amp comparators	2		
5. Op-amp amplifiers	2		
6. Voltage regulators. Integrated voltage regulators	2		
7. Sinusoidal oscillators. Nonsinusoidal oscillators	2		
LABORATORY			
1. Lab instrumentation. RC circuits	2		
2. Applications of DR circuits	2		
3. MOSFET logic circuits	2		
4. Op-amp voltage comparator	2		
5. Op-amp basic amplifier	2		
6. Sinusoidal oscillator. Audio signals	2		
7. Lab do-overs. Activity concluding	2		

Bibliography

1 Oltean, G., Sipos, Emilia, Miron, C., Ivanciu, Laura, Laboratory Manual for Electronic Devices, Editura UTPRESS, Cluj Napoca, 2010, ISBN 978-973-662-542-8, 90 pag.
2. Şipoş, Emilia, Oltean, G., Miron, C., Ivanciu, Laura, Gordan, Mihaela, Fundamental Electronic Circuits. Laboratory Manual, UT Pres, Cluj-Napoca, 2009, ISBN 978-973-662-503-9; 91 pag

On – line references

Oltean, G, Fundamentals of Electronic Circuits, on-line: http://www.bel.utcluj.ro/dce/didactic/fec_aai/

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 agree 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	Assessment criteria	Assessment methods	Weight in the final grade
Course	The level of theoretical knowledge and practical skills acquired for the analysis and (re)design of electronic circuits	Written exam: problem solving	E, max 10 pts. 50%
Seminar	The level of the abilities acquired for problem solving of electronic circuits	Continuous formative evaluation	S, max. 10 pts. 25%

Laboratory	The level of the abilities acquired for experimental analysis of electronic circuits	Continuous formative evaluation	L, max. 10 pts. 25%
Project	-	-	-

Minimum standard of performance:

- Recognizing and understanding basic concepts specific to electronic devices, fundamental electronic circuits.
- Analysis of circuits with diodes, LED, ZD
- Structure and analysis of logic circuits with MOS transistors
- Structure and analysis of op-amp comparators (VTC, waveforms)
- Structure and analysis of op-amp amplifiers (gain, VTC, waveforms)
- Structure and analysis of voltage regulators (reference, output voltage and current, protection)
- Structure and analysis of signal generators (condition for oscillation, waveforms, oscillation frequency)
- Elements referring to the design and redesign of some fundamental electronic circuits.
- Finding the performances of electronic circuits by experiments / simulation
- Connection and use of electronic instruments in laboratory/simulator as well as the experimental/simulator circuits for the study of fundamental electronic circuits
- Recording and analysis of numerical data obtained experimentally/by simulation

$L \geq 5$, $E \geq 4$ Mark = 0.5E+0.25L+0.25S

Date of filling in:		**Title First name NAME**	**Signature**
15.09.2022	Course	Prof. Gabriel OLTEAN, PhD	
	Applications	Assoc.prof. Emilia ȘIPOȘ, PhD	

Date of approval by the Department Board ……..

Head of Departament .....
Prof.dr.ing. Honoriu VĂLEAN

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Date of approval by the Faculty Council ……

Dean
Prof.dr.ing. Liviu Cristian MICLEA

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