SYLLABUS

1. Data about the program of study

1.1	Institution	The 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	Applied Electronics/ Telecommunications Tehnologies and Systems
1.7	Form of education	Full time
1.8	Subject code	

2. Data about the subject

2.1	Subject name					Analysis and Synthesis of Circuits					
2.2	Subject area					Semnale, circuite şi sisteme					
2.3	Course responsible/lecturer					Lecturer Ioana Sărăcuţ, PhD eng					
2.4	Teachers in charge of applications					Lecturer Ioana Sărăcuţ,PhD eng Lecturer Ervin Szopos, PhD eng Assistent Călin Fărcaş, PhD eng.					
2.5	Year of Study	II	2.6	Semester	2	2.7	Assessment	Exam	2.8	Subject category	O/DD

3. Estimated total time

Year / Sem.	Subject name	No. of weeks	Course	Applications			Course	Applications			Indiv. study	TOTAL	Credits
			[hours/week]				[hours/sem.]						
				S	L	P		S	L	P			
II / 1	Analysis and Synthesis of Circuits	14	2	1	1		28	14	14		54	110	5

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	aplications	2
3.4	Total hours in the curriculum	56	3.5	of which, course	28	3.6	aplications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	28
Supplementary study in the library, online and in the field	-
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	20
Tutoring	3
Exams and tests	3
Other activities	

3.7	Total hours of individual study	54
3.8	Total hours per semester	110
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Relations and theorems for electric circuits. General methods for circuit analysis

5. Requirements (where appropriate)

5.1	For the course	Amphitheatre, Cluj-Napoca
5.2	For the applications	Laboratory, Cluj-Napoca

6. Specific competences

Professional competences	Theoretical knowledge (what the student must know):	After completing the discipline, the students will have the following theoretical knowledge: - Circuit topology, oriented graphs and signal flowgraphs; - Algebraic and graphical stability analysis criteria; - State space circuit analysis; - Circuit impedance matching and electromagnetic wave propagation; - Circuit design for impedance matching, rejection of frequencies; - Passive filters design (constant-k, derived).
	Acquired skills (what the student is able to do):	After completing the discipline, the students will be able to: - Apply matrix analysis, as in some mathematical software (Matlab, Python, etc.); - Consider a circuit as a system and find its general features (not depending on the physical nature of the system); - Design an impedance matching circuit or use the impedance matching conditions in designing other circuits; - Design constant-k and derived filters ; - Make the neccessary changes in a derived filter to correct the characteristic impedance; - Resize a circuit for other values of cutoff frequencies and/or load resistance.
	Acquired abilities: (what type of equipment the student is able to handle)	After completing the discipline, the students will be able to: - Use the OrCAD software for the analysis of impedance matching circuits, passive filters; - Model several time-continuous linear time-invariant systems using the OrCAD software; - Use the Digilent Analog Discovery board, having 2 ossciloscopes channels, 2 programmable signal generator channels, differential regulated supply, digital inputs and outputs; - Measure the cutoff frequencies and analyse the frequency plots.
	In accordance with Grila1 and Grila2 RNCIS	
Cross competences (Grila1 and Grila2		

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

7.1	General objectives	Developing the competences regarding analysis and synthesis of passive circuits.
7.2	Specific objectives	1. Knowledge and understanding of basic approaches

		regarding circuit analysis. 2. Development of skills and abilities for the analysis and synthesis of passive circuits.

8. Contents

8.1 Lecture (syllabus)		Teaching methods	Notes
1	Circuit analysis with signal flowgraphs.	Presentation, heuristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation	Use of .ppt presentations, projector, blackboard
2	Stability analysis with linear invariant systems .		
3	Graphical stability analysis criteria (Michailov, Nyquist).		
4	State space. Definitions of state variables.		
5	Formulation of state equations for a passive circuit.		
6	Passive two-ports analysis. Symmetric and nonsymmetric two-ports.		
7	Applications of two-ports.		
8	Matching of circuits.		
9	T, π and Γ-shaped impedance matching circuits. Rejection of frequencies with impedance matching circuits.		
10	Passive filters. Constant-k filters.		
11	Derived filters. Characteristic impedance correction. Compound filters.		
12	Applications of filters.		
13	System function approximation. Active filters: biquads		
14	Review. Examination preparation.		
8.2. Applications (Seminar)		Teaching methods	Notes
1	Signal flowgraph.	Solving of problems and review of some theoretical aspects.	Use of blackboard, but also of computer and projector.
2	Stability criteria.		
3	State space.		
4	Passive two-ports.		
5	Impedance matching circuits.		
6	Constant-k and derived filters.		
7	Filters		
8.3. Aplicații (laborator)		Teaching methods	Notes
1	IInd order low, high and pass-band filters.	Didactic and experimental proof, didactic exercise, team work	Use of Orcad software, Analog Discovery board
2	Elementary one-ports.		
3	Simple T-form impedance matching circuits.		
4	T-shaped impedance matching circuit with frequency rejection		
5	Constant-k filters.		
6	Active filters.		
7	Lab classes recovery.		

Bibliography

1. Victor Popescu – *Semnale, circuite şi sisteme. Teoria semnalelor*, Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2001.
2. Marina Dana Ţopa – *Semnale, circuite şi sisteme. Teoria sistemelor*, Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2002.
3. Victor Popescu – *Semnale, circuite şi sisteme. Teoria circuitelor*, Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2003.
4. Adelaida Mateescu ş.a. – *Semnale şi sisteme. Aplicaţii în filtrarea semnalelor*, Editura Teora, 2001.
5. Erwin Szopos, Marina Dana Ţopa, Ioana Sărăcuţ – *Analiza şi sinteza circuitelor. Culegere de probleme,* Editura U.T. Press, Cluj-Napoca, 2011.
6. Ioana Popescu, Erwin Szopos, Victor Popescu, Marina Dana Ţopa – *Semnale, circuite şi sisteme. Indrumător de laborator IV,* Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2003.
7. pagina web a disciplinei (prezentări curs, lucrări de laborator): http://www.bel.utcluj.ro/scs/rom/asc_main.html

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, 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
Course		The level of acquired theoretical knowledge		2 written tests TC (30p)		Max 30%
Laboratory		The level of acquired skills and abilities		Evaluation during the semester TL (10p)		Max 10%
Examen		The level of acquired theoretical knowledge, of skills and abilities		Written examination E (60p): problems (60p)		Max 60%
Final mark = (TC+TL+E)/10						
10.4 Minimum standard of performance						
TC+TL≥20						

Date of filling in
01.10.2018

Teachers in charge of applications
Lecturer Ioana Sărăcuţ, PhD eng.
Lecturer Ervin Szopos, PhD eng.
Assist. Călin Fărcaş, PhD eng.

Course responsible
Lecturer Ioana Sărăcuţ, PhD eng.

Date of approval in the department
02.10.2018

Head of department
Prof. Sorin Hintea, PhD eng.