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	Telecommunications Technologies and Systems/Engineer, Applied Electronics/Engineer
1.7	Form of education	Full time
1.8	Subject code	TST-E26.00, EA-E26.00

2. Data about the subject

2.1	Subject name					Analysis and Synthesis of Circuits					
2.2	Subject area					Signals, Circuits and Systems					
2.3	Course responsible/lecturer					Professor Marina Topa, PhD					
2.4	Teachers in charge of applications					Assistant Prof. Ervin Szopos, PhD Assistant Prof. Ioana Saracut, PhD					
2.5	Year of Study	II	2.6	Semester	2	2.7	Assessment	Exam	2.8	Subject category	DID/DOB

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 / 2	Analysis and Synthesis of Circuits	14	2	1	1		28	14	14		74	130	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	40
Tutoring	3
Exams and tests	3
Other activities	

3.7	Total hours of individual study	74
3.8	Total hours per semester	130
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, topological 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); - 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 tofor 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 passive circuits; - Model several time-continuous liniar time-invariant systems using the OrCAD software; - Plot the magnitude and phase of the frequency plots, measure the cutoff frequencies, fidn the pass-and stop-bands.
	In accordance with Grila1 and Grila2 RNCIS	- C1. To use the fundamental elements regarding electronic devices, circuits, systems, instrumentation and technology - C2. To apply basic methods for signal acquisition and processing - C4. To design, implement and operate data, voice, video and multimedia services, based on the understanding and application of fundamental concepts from the field of communications and information transmission.
Cross competences (Grila1 and Grila2 RNCIS)		N.A.

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	Introduction. Circuits topology basics . Oriented topological graphs.	Presentation, heuristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation	Use of .ppt presentations, projector, blackboard
2	Circuit analysis with signal flowgraphs.		
3	Stability analysis with liniar invariant systems. Algebraic stability criteria (Routh, Hurwitz).		
4	Graphical stability analysis criteria (Michailov, Nyquist).		
5	State space. Definitions of state variables. Formulation of state equations for a passive circuit.		
6	Description of n-ports. Scattering parameters.		
7	Passive two-ports analysis. Symmetric and nonsymmetric two-ports.		
8	Waves propagation and matching of circuits.		
9	T, π and Γ-form impedance matching circuits. Rejection of frequencies with impedance matching circuits.		
10	Types of passive filters. Universal frequency characteristics. Constant-k filters.		
11	Derived filters. Characteristic impedance correction. Compound filters.		
12	Frequency transformation. System function approximation.		
13	One-port and two-port synthesis.		
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	Circuit synthesis.		
8.3. Applications (Laboratory)		Teaching methods	Notes
1	IInd order low, high and pass-band filters.	Didactic and experimental proof, didactic exercise, team work	Use of Orcad software
2	Elementary one-ports.		
3	Waves propagation and circuit matching.		
4	Simple T-form impedance matching circuits.		
5	Impedance matching circuits with frequency rejection.		
6	Constant-k 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

Competences acquired will be used in the following COR occupations (Electronics Engineer; Telecommunications Engineer; Electronics Design Engineer; System and Computer Design Engineer; Communications Design Engineer) or in the new occupations proposed to be included in COR (Sale Support Engineer; Multimedia Applications Developer; Network Engineer; Communications Systems Test Engineer; Project Manager; Traffic Engineer; Communications Systems Consultant).

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.		4 written tests TC (20p)		Max 20%
Seminar		The level of acquired skills and abilities		4 written tests TS (20p)		Max 20%
Laboratory		The level of acquired skills and abilities		4 written tests TL (20p)		Max 20%
Examen		The level of acquired theoretical knowledge, of skills and abilities		Written examination E (50p): theory (20p) and problems (30p)		Max 50%
Final mark = (TC+TS+TL+E)/10						
10.4 Minimum standard of performance						
TC+TS+TL>20p si E>20p						

Date of filling in
12.02.2015

Course responsible
Prof. Marina Topa, PhD.

Teachers in charge of applications
Assist. Prof. Ioana Saracut, PhD
Assist. Prof. Ervin Szopos, PhD

Date of approval in the department
12.02.2015

Head of department
Prof. Sorin Hintea, PhD