SYLLABUS

1. Data about the study program

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	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Applied Electronics / Engineer
1.7 Form of education	Full time
1.8 Subject code	25.00

2. Data about the subject

2.1 Subject name	Analysis and Synthesis of Circuits						
2.2 Subject area	Theoretical area Methodological area Analytic area						
2.3 Course responsible/lecturer	Assist. Prof Ioana Sărăcuţ, PhD Eng. Ioana.Saracut@bel.utcluj.ro						
2.4 Teachers in charge with seminary / laboratory	Assist. Prof Ioana Sărăcuţ, PhD Eng. Ioana.Saracut@bel.utcluj.ro Assist. Prof Erwin Szopos, PhD Eng. Erwin.Szopos@bel.utcluj.ro Teach. Assist. Călin Fărcaş, PhD Eng. CalinFarcas@bel.utcluj.ro						
2.5 Year of Study	II	2.6 Semester	2	2.7 Assessment	E	2.8 Subject category	DD/DI

3. Estimated total time

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

Distribution of time	hours
Manual, lecture material and notes, bibliography	28
Supplementary study in the library, online specialized platforms and in the field	18
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	15
Tutoring	5
Exams and tests	3
Other activities	

3.7 Total hours of individual study	69
3.8 Total hours per semester	125
3.9 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	Knowledge acquired in Signals and Systems course.
4.2 Competence	Relations and theorems for electric circuits.

5. Requirements (where appropriate)

5.1 for the course	Amphitheatre, Cluj-Napoca
5.2 for the seminaries / laboratory classes	Laboratory, Cluj-Napoca

6. Specific competences

Professional competences	C1. To use the fundamental elements regarding electronic devices, circuits, systems, instrumentation and technology • C1.1 Recognizing and describing concepts that are specific to the fields of calculability, complexity, programming paradigms, and modeling computational and communication systems • C1.5 Providing a theoretical background for the characteristics of the designed systems C2 Applying the basic methods for signal acquisition and processing • C2.1 Temporal, spectral and statistical characterization of signals • C2.2 Explaining and interpreting the methods of acquisition and processing of signals • C2.3 Use of simulation environments for signal analysis and processing • C2.4 Use of the specific method and tools for signal analysis C4. Design and use of low complexity hardware and software applications specific to the applied electronics • C4.1 Defining the concepts, principles and methods used in the fields: computer programming, high-level and specific languages, CAD techniques for making electronic modules, microcontrollers, computer systems architecture, programmable electronic systems, graphics, reconfigurable hardware architectures • C4.2 Explanation and interpretation of the specific requirements of the hardware and software structures in the fields: computer programming, high-level and specific languages, CAD techniques for making electronic modules, microcontrollers, computer systems architecture, programmable electronic systems, graphics, reconfigurable hardware architectures
Cross competences	N.A.

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

7.1 General objective	The development of the skills regarding the analysis and synthesis of passive and active systems.
7.2 Specific objectives	**1.** Knowledge and understanding of basic approaches regarding analysis and synthesis of systems. **2.** Development of skills and abilities for the analysis and synthesis of passive circuits.

8. Contents

8.1 Lecture	**Teaching Methods**	**Remarks**
1. Circuit analysis with signal flowgraphs.		
2. Stability analysis with linear invariant systems.		

3. Graphical stability analysis criteria (Michailov, Nyquist).	Presentation, exemplifications, problem presentation, case study, formative evaluation	Use of the blackboard
4. State space. Definitions of state variables.		
5. Formulation of state equations for a passive circuit.		
6. Passive two-ports analysis. Symmetric and nonsymmetrical two-ports.		
7. Applications of two-ports.		
8. Matching of circuits.		
9. T, PI 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.		
12. Applications of filters.		
13. System function approximation. Active filters: biquads		
14. Review. Examination preparation.		

Bibliography

1. Alan V. Oppenheim, Alan S. Willsky - "Signals and Systems (Second Edition)", Pearson Education, Inc. Publishing as Prantice Hall, 1997

2. Raymond A. DeCarlo - "Circuit Analysis: Time Domain, Phasor, and Laplace Transform Approaches ", Oxford University Press, 2001

3. Luis F. Chaparro - "Signals and Systems using MATLAB", Academic Press, 2014

The web page of the course: http://www.bel.utcluj.ro/scs/

8.2 Seminary classes	**Teaching Methods**	**Remarks**
1. Signal flowgraph.	Solving of problems and review of some theoretical aspects. Didactic and experimental proof, didactic exercise, team work	Use of the blackboard. Use of Digilent board.
2. Stability criteria.		
3. State space.		
4. Passive two-ports.		
5. Impedance matching circuits.		
6. Constant-k and derived filters.		
7. Filters		
Laboratory classes		
1. Second order low, high and pass-band filters.		
2. Elementary one-ports.		
3. Simple T-form impedance matching circuits.		
4. Impedance matching circuit with frequency rejection.		
5. Constant-k filters.		
6. Active filters.		
7. Lab classes recovery.		

Bibliography

1. Alan V. Oppenheim, Alan S. Willsky - "Signals and Systems (Second Edition)", Pearson Education, Inc. Publishing as Prantice Hall, 1997

2. Raymond A. DeCarlo - "Circuit Analysis: Time Domain, Phasor, and Laplace Transform Approaches ", Oxford University Press, 2001
3. Luis F. Chaparro - "Signals and Systems using MATLAB", Academic Press, 2014
Weekly homework problems submitted by email.
The web page of the course: http://www.bel.utcluj.ro/scs/

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** Evaluation criteria	**10.2** Evaluation methods	**10.3** Weight in the final grade
10.4 Lecture	The level of acquired theoretical knowledge	2 written tests (30p) – TC	Max 30%
10.5 Laboratory	The level of acquired skills and abilities	Evaluation during the semester (10p) – TL	Max 10%
Exam	The level of acquired theoretical knowledge, of skills and abilities	Written examination (60p) – E	Max 60%
Final mark = (TC+TL+E) / 10			
10.6 Minimum standard of performance			

Quality level:
Minimum knowledge:
- Knowledge of T, PI and Γ-shaped impedance matching circuits
- System function approximation. Active filters: biquads
- Knowledge and understanding of basic approaches regarding analysis and synthesis of systems

Minimum competences:
- Development of skills and abilities for the analysis and synthesis of passive circuits

Quantitative level:
- TC+TL > 20p and E > 25p

Date of filling in:	**Teachers**		**Signature**
29.09.2019	Course	Assist. Prof Ioana Sărăcuţ, PhD Eng.	
	Applications	Assist. Prof Ioana Sărăcuţ, PhD Eng.	
		Assist. Prof Erwin Szopos, PhD Eng.	
		Teach. Assist. Călin Fărcaş, PhD Eng.	

Date of approval in the department of Bases of Electronics _____	Head of department Prof. Sorin Adrian HINTEA, PhD Eng.
Date of approval in the Council of Faculty of Electronics, Telecommunications and Information Technology _____	Dean Prof. Gabriel OLTEAN PhD Eng.