SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Bases of Electronics
1.4 Field of study	Electronic Engineering, Telecommunications and Information Technologies
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-E25.00/EA-E25.00

2. Data about the subject

2.1 Subject name	Analysis and Synthesis of Circuits						
2.2 Subject area	Theoretical area						
2.3 Course responsible/lecturer	Assist. Prof. Ioana SARACUT, Ph.D. - Ioana.Saracut@bel.utcluj.ro						
2.4 Teachers in charge with seminary / laboratory	Assist. Prof. Ioana SARACUT, Ph.D. - Ioana.Saracut@bel.utcluj.ro Assist. Prof. Ervin SZOPOS, Ph.D. - Erwin.Szopos@bel.utcluj.ro Assist. Prof. Calin FARCAS, Ph.D. - Calin.Farcas@bel.utcluj.ro						
2.5 Year of Study	II	**2.6** Semester	4	**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	10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	25
Tutoring	3
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. Use of the fundamental elements related to devices, circuits, systems, instrumentation and electronic technology C2. Applying the basic methods for the acquisition and processing of signals C4. Design, implementation and operation of data, voice, video and multimedia services. This is based on the understanding and the application of fundamental concepts in telecommunications and transmission of information
Transversal 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.	Presentation, exemplifications, problem presentation, case study, formative evaluation.	Use of the 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 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 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 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 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** 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			
TC+TL > 20p and E > 25p			

Date of filling in:	Responsible	Title First name SURNAME	Signature
16.06.2025	Course	Assist. Prof. Ioana SARACUT, Ph.D.	
	Applications	Assist. Prof. Ioana SARACUT, Ph.D.	
		Assist. Prof. Ervin SZOPOS, Ph.D.	
		Assist. Prof. Calin FARCAS, Ph.D.	

Date of approval in the Council of the Communications Department 18.06.2025	Head of Communications Department Prof. Virgil DOBROTA, Ph.D.
Date of approval in the Council of the Faculty of Electronics, Telecommunications and Information Technology 25.06.2025	Dean Prof. Ovidiu POP, Ph.D.