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/ Telecommunications Technologies and Information Systems
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						
2.3 Course responsible/lecturer	Lecturer Ioana Sărăcuţ, PhD eng. Ioana.Saracut@bel.utcluj.ro						
2.4 Teachers in charge of applications	Lecturer Ioana Sărăcuţ, PhD eng.						
2.5 Year of Study	II	**2.6** Semester	II	**2.7** Assessment	E	**2.8** Subject category	O/DD

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
Individual study					hours
Manual, lecture material and notes, bibliography					28
Supplementary study in the library, online and in the field					8
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					12
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	Knowledge acquired in Signals and Systems course.
4.2 Competence	Relations and theorems for electric circuits.

5. Requirements (where appropriate)

5.1 for course	Microsoft Teams platform

5.2 for applications	Microsoft Teams platform

6. Specific skills

Professional skills	After completing the discipline, the students will be able to: - apply classical analysis methods, as in some mathematical software programs; - 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 m-derived filters; - modify a derived filter in order to correct the characteristic impedance; - resize a circuit for other values of cutoff frequencies and/or load resistance.
Transverse skills	After completing the discipline, the students will improve: - the oral and written communication in English; - problem solving and decision making; - team work; - autonomous learning.

7. The objectives of the course (based on the grid of specific skills accumulated)

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.	
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		
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	Seminary – Use of the blackboard. Laboratory – Use of the Matlab program.
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. Signals and Systems (recap).		
2. Linear Time-Invariant Systems.		
3. Stability of Systems		
4. 1st order and 2nd order Systems.		
5. Filtering.		
6. State Variables.		
7. Lab classes recovery.		
Bibliography Weekly homework problems submitted by email.		

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			
TC+TL > 20p and E > 25p			

Date of filling in:	Teachers		Signature
26.06.2024	Course	Lecturer Ioana Sărăcuţ, PhD eng.	
	Applications	Lecturer Ioana Sărăcuţ, PhD eng.	

Date of approval in the department 26.06.2024	Head of department Prof. Hintea Sorin Adrian, PhD eng.
Date of approval in the Faculty Council 11.07.2024	Dean Prof. Pop Ovidiu Aurel, PhD eng.