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 / Economic Engineering in Electronics and Energetics
1.7 Form of education	Full time
1.8 Subject code	17.00

2. Data about the subject

2.1 Subject name		**Signals and Systems**					
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. Lecturer Ervin Szopos, PhD eng. Erwin.Szopos@bel.utcluj.ro					
2.5 Year of Study	II	**2.6** Semester	I	**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 mathematics course and circuit theory course.
4.2 Competence	Mathematical notions: complex numbers, Laplace transform, trigonometry, Fourier transform, Laplace transform, computation of simple integrals. Relations and theorems for electric circuits.

5. Requirements (where appropriate)

5.1 for course	Microsoft Teams platform
5.2 for applications	Laboratory, Cluj-Napoca

6. Specific skills

Professional skills	After completing the discipline, the students will be able to: - find the mathematical model of the time-continuous / discrete signals; - plot the spectra for periodic and aperiodic signals; - find the mathematical model for time-continuous / discrete linear time-invariant systems; - find the response of a time-continuous / discrete linear time-invariant system to an excitation; - plot the frequency characteristics (Bode plots) for a system; - analyze several modulated signals.
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 study of signals and systems.
7.2 Specific objectives	**1.** Knowledge and understanding of basic approaches regarding signals and systems. **2.** Development of skills and abilities for the analysis of time-continuous signals. **3.** Development of skills and abilities for the analysis of time-continuous linear time-invariant systems.

8. Contents

8.1 Lecture	**Teaching Methods**	**Remarks**
1. Introduction into Signals and Systems. Classification of signals. Basic operations of signals. Harmonic signals.	Presentation, exemplifications, problem presentation, case study, formative evaluation.	Onsite, using the blackboard.
2. Continuous time periodic signals. Non-harmonic signals. Fourier series. Properties of the Fourier series.		
3. Continuous-time aperiodic signals. Fourier transform.		
4. Properties of the Fourier transform. Ideal filters.		
5. Classification of systems. Description of linear invariant time systems: differential equation, impulse response, transfer function. Laplace transform.		

6. Description of linear invariant time systems: step response, frequency response.		
7. Applications of LTI systems.		
8. Bode plots.		
9. Discrete-time periodic signals. Discrete-time Fourier series. Discrete-time aperiodic signals. Discrete-time Fourier transform.		
10. Description of linear invariant time-discrete systems: difference equation, unit impulse response, transfer function.		
11. Signals sampling. Sampling theorem. Spectral analysis of sampled signals. Reconstruction of time-continuous signals.		
12. Amplitude modulation. Special amplitude modulation procedures.		
13. Position and frequency modulation.		
14. Review. Preparation for examination.		
Bibliography		
8.2 Seminary classes	**Teaching Methods**	**Remarks**
1. Introduction into signal theory. Complex numbers. Sinusoidal signals.	Solving of problems and review of some theoretical aspects. Didactic and experimental proof, didactic exercise, teamwork	Onsite, using the blackboard.
2. Spectra of periodic time-continuous signals.		
3. Spectra of aperiodic time-continuous signals.		
4. Linear invariant systems.		
5. Bode plots.		
6. Spectra of discrete-time signals. Sampled signals.		
7. Modulated signals.		
Laboratory classes		
1. Introduction of the Analog Discovery Board.		
2. Spectrum of periodic time-continuous signals.		
3. Spectrum of the periodic square wave.		
4. First order systems.		
5. Sampled signals.		
6. Amplitude and frequency modulated signals.		
7. Lab recovery of laboratory activity.		
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 agree 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**
30.06.2023	Course	Lecturer Ioana Sărăcuţ, PhD eng.	
	Applications	Lecturer Ioana Sărăcuţ, PhD eng.	
		Lecturer Ervin Szopos, PhD eng.	

Date of approval in the department 11.07.2023	Head of department Prof. Hintea Sorin Adrian, PhD eng.
Date of approval in the Faculty Council 12.07.2023	Dean Prof. Pop Ovidiu Aurel, PhD eng.