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-E17.00/EA-E17.00

2. Data about the subject

2.1 Subject name	Signals and Systems						
2.2 Subject area	Theoretical area						
2.3 Course responsible	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. Calin FARCAS, Ph.D. - Calin.Farcas@bel.utcluj.ro						
2.5 Year of Study	II	**2.6** Semester	3	**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** seminary / laboratory	2
3.4 Total hours in the curriculum	56	of which: **3.5** course	28	**3.6** seminary / laboratory	28

Distribution of time	hours
Manual, lecture material and notes, bibliography	28
Supplementary study in the library, online specialized platforms and in the field	8
Preparation for seminaries/laboratory works, homework, reports, portfolios, essays	28
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 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 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 C3. Application of the basic knowledge, concepts and methods regarding the architecture of computer systems, microprocessors, microcontrollers, languages and programming techniques 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 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.	Use of 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 The web page of the course: http://www.bel.utcluj.ro/scs/		
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, team work	Use of the blackboard. Use of Digilent board.
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. 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

Quality level:

Minimum knowledge:

- ✓ the ways of describing an analog / discrete system
- ✓ the classification of analog / discrete signals
- ✓ the main characteristics of the sampling process and modulation process

Minimum competences:

- ✓ sketching of the spectra for any periodic / aperiodic continuous signal
- ✓ finding the transfer function and the output signal for a system (circuit)

Quantitative level:

- ✓ *attending all the lab works*
- ✓ TC+TL > 20p and E > 25p

final grade = (TC+TL+E) / 10

Date of filling in:	**Responsible**	**Title First name SURNAME** Assist. Prof.	**Signature**
27.09.2021	Course	Ioana SARACUT, Ph.D.	
	Applications	Assist. Prof. Ioana SARACUT, Ph.D.	
		Assistant Prof. Calin FARCAS, Ph.D.	

Date of approval in the Department of Communications 27.09.2021	Head of Communications Department Prof. Virgil DOBROTA, Ph.D.
Date of approval in the Council of Faculty of Electronics, Telecommunications and Information Technology 27.09.2021	Dean Prof. Gabriel OLTEAN, Ph.D.