SYLLABUS

1. Data about the program of study

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	Electronics and Telecommunications Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Applied Electronics/ Telecommunications Technologies and Systems
1.7	Form of education	Full time
1.8	Subject code	EL2113

2. Data about the subject

2.1	Subject name					Signals Theory					
2.2	Subject area					Signals, circuits and systems					
2.3	Course responsible/lecturer					Lecturer Ioana Sărăcuţ, PhD eng.					
2.4	Teachers in charge of applications					Lecturer Ioana Sărăcuţ, PhD eng. Lecturer Erwin Szopos, PhD eng. Assistent Călin Fărcaş, PhD eng.					
2.5	Year of Study	II	2.6	Semester	1	2.7	Assessment	Exam	2.8	Subject category	O/DD

3. Estimated total time

Year / Sem.	Subject name	No. of weeks	Course	Applications			Course	Applications			Indiv. study	TOTAL	Credits
			[hours/week]				[hours/sem.]						
				S	L	P		S	L	P			
II / 1	Signals Theory	14	2	1	1		28	14	14		54	110	5

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

Individual study	Hours
Manual, lecture material and notes, bibliography	28
Supplementary study in the library, online and in the field	-
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	20
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	
4.2	Competence	Mathematical notions: complex numbers, 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 applications	Laboratory, Cluj-Napoca

6. Specific competences

Professional competences	Theoretical knowledge (what the student must know):	After completing the discipline, the students will have the following theoretical knowledge: - Classification of signals and systems with respect to different criteria; - Time and frequency domain analysis of time-continuous periodic and aperiodic signals; - Time and frequency domain description of time-continous linear time-invariant systems; - The sampling theorem and reconstruction of analog signals from samples; - Modulation procedures with harmonic carrier: amplitude modulation and special amplitude modulation procedures, frequency and phase modulation; demodulation procedures.
	Acquired skills (what the student is able to do):	After completing the discipline, the students will be able to: - Find the mathematical model of the time-continuous signals; - Compute and plot the spectra for time-continuous periodic and aperiodic signals; - Find the mathematical model for time-continuous linear time-invariant systems; - Find the response of a time-continuous linear time-invariant system to an excitation; - Plot the frequency characteristics (Bode plots) for a system; - Analyse several modulated signals.
	Acquired abilities: (what type of equipment the student is able to handle)	After completing the discipline, the students will be able to: - Use the OrCAD software for the analysis of passive circuits; - Model several time-continuous linear time-invariant systems using the OrCAD software; - Use the Digilent Analog Discovery board, having 2 ossciloscopes channels, 2 programmable signal generator channels, differential regulated supply, digital inputs and outputs; - Measure the parameters of the frequency plots.
	In accordance with Grila1 and Grila2 RNCIS	
Cross competences (Grila1 and Grila2 RNCIS)		

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

7.1	General objectives	Developing the competences regarding analysis 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-continouos signals. 3. Development of skills and abilities for the analysis of time-continouos linear time-invariant systems.

8. Contents

8.1 Lecture (syllabus)		Teaching methods	Notes
1	Introduction into signals theory. Classification of signals. Basic operations of signals. Harmonic signals.	Presentation, heuristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation	Use of .ppt presentations, projector, blackboard
2	Contionuous 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.		
8.2. Applications (Seminar)		**Metode de predare**	**Observaţii**
1	Introduction into signal theory. Complex numbers. Sinusoidal signals.	Solving of problems and review of some theoretical aspects.	Use of blackboard, but also of computer and projector.
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.		
8.3. Applications (laboratory)		**Metode de predare**	**Observaţii**
1	Introduction of the Analog Discovery Board.	Didactic andDidactic and experimental proof, didactic exercise, team work	Use of Digilent 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

1. Victor Popescu – *Semnale, circuite şi sisteme. Teoria semnalelor*, Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2001.
2. Marina Dana Ţopa – *Semnale, circuite şi sisteme. Teoria sistemelor*, Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2002.
3. Ioana Sărăcuţ, Erwin Szopos, Victor Popescu – *Teoria semnalelor. Culegere de probleme,* Editura U.T. Press, Cluj-Napoca, 2010.
4. Ioana Sărăcuţ, Victor Popescu – *Teoria semnalelor. Culegere de grile,* Editura U.T. Press, Cluj-Napoca, 2010.
5. Ioana Popescu, Erwin Szopos, Victor Popescu, Marina Dana Ţopa – *Semnale, circuite şi sisteme. Indrumător de laborator IV,* Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2003.
6. pagina web a disciplinei prezentări curs, lucrări de laborator): http://www.bel.utcluj.ro/scs/rom/ts_main.html

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	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		The level of acquired theoretical knowledge		2 written tests TC (30p)		Max 30%
Laboratory		The level of acquired skills and abilities		Evaluation during the semester TL (10p)		Max 10%
Examen		The level of acquired theoretical knowledge, of skills and abilities		Written examination E (60p): problems (60p)		Max 60%
Final mark = (TC+TL+E)/10						
10.4 Minimum standard of performance						
TC+TL≥20						

Date of filling in
15.09.2018

Teachers in charge of applications
Lecturer Ioana Sărăcuţ, PhD eng.
Lecturer Erwin Szopos, PhD eng.
Assist. Călin Fărcaş, PhD eng.

Course responsible
Prof. Marina Ţopa, PhD eng.

Date of approval in the department
20.09.2018

Head of department
Prof. Sorin Hintea, PhD eng.