

## 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	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 Theory									
2.2	Subject area	Signals, circuits and systems									
2.3	Course responsible/lecturer	Prof. Marina Țopa, PhD									
2.4	Teachers in charge of applications	Assist. Prof. Ervin Szopos, PhD									
2.5	Year of Study	II	2.6	Semester	1	2.7	Assessment	Exam	2.8	Subject category	DD/DI

### 3. Estimated total time

Year / Sem.	Subject name	No. of weeks	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		69	125	5

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the curriculum	56	3.5	of which, course	28	3.6	applications	28
Individual study								Hours
Manual, lecture material and notes, bibliography								23
Supplementary study in the library, online and in the field								20
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	69						
3.8	Total hours per semester	125						
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: <ul style="list-style-type: none"> <li>- Classification of signals and systems with respect to different criteria;</li> <li>- Time and frequency domain analysis of time-continuous periodic and aperiodic signals;</li> <li>- Time and frequency domain description of time-continuous linear time-invariant systems;</li> <li>- The sampling theorem and reconstruction of analog signals from samples;</li> <li>- Modulation procedures with harmonic carrier: amplitude modulation and special amplitude modulation procedures, frequency and phase modulation; demodulation procedures.</li> </ul>
	Acquired skills (what the student is able to do):	After completing the discipline, the students will be able to: <ul style="list-style-type: none"> <li>- Find the mathematical model of the time-continuous signals;</li> <li>- Compute and plot the spectra for time-continuous periodic and aperiodic signals;</li> <li>- Find the mathematical model for time-continuous linear time-invariant systems;</li> <li>- Find the response of a time-continuous linear time-invariant system to an excitation;</li> <li>- Plot the frequency characteristics (Bode plots) for a system;</li> <li>- Analyse several modulated signals.</li> </ul>
	Acquired abilities: (what type of equipment the student is able to handle)	After completing the discipline, the students will be able to: <ul style="list-style-type: none"> <li>- Use the OrCAD software for the analysis of passive circuits;</li> <li>- Model several time-continuous linear time-invariant systems using the OrCAD software;</li> <li>- Measure the parameters of the frequency plots.</li> </ul>
	In accordance with Grila1 and Grila2 RNCIS	C1. To use the fundamental elements regarding electronic devices, circuits, systems, instrumentation and technology C2. To apply basic methods for signal acquisition and processing C3. To apply knowledge, concepts and basic methods regarding computing systems' architecture, microprocessors, microcontrollers, programming languages and techniques C4. To design, implement and operate data, voice, video and multimedia services, based on the understanding and application of fundamental concepts from the field of communications and information transmission.
Cross competences (Grila1 and Grila2 RNCIS)	N.A.	

## 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	<ol style="list-style-type: none"> <li>1. Knowledge and understanding of basic approaches regarding signals and systems.</li> <li>2. Development of skills and abilities for the analysis of time-continuous signals.</li> <li>3. Development of skills and abilities for the analysis of time-continuous linear time-invariant systems.</li> </ol>

## 8. Contents

8.1 Lecture (syllabus)		Teaching methods	Notes
1	Introduction into signals theory. Basic operations of signals. Sinusoidal signals.	Presentation, heuristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation	Use of .ppt presentations, projector, blackboard
2	Harmonic analysis of periodic signals. Harmonic Fourier series. Properties of harmonic Fourier series.		
3	Applications of Fourier series: spectrum of periodic unit impulse signal, spectrum of periodic square wave. Unit-step and unit impulse signal.		
4	Spectral analysis of impulses. Fourier transform.		
5	Properties of Fourier transform. Applications: spectra of unit impulse, square wave, triangle signals.		
6	Introduction into systems theory. Classification of systems. Description of linear invariant analog systems: differential equation, unit impulse response, transfer function.		
7	Description of linear invariant analog systems: unit step response, frequency response, gain and phase.		
8	Logarithm frequency characteristics plots (Bode plots).		
9	Applications of systems description.		
10	Signals sampling. Sampling theorem. Spectral analysis of sampled signals.		
11	Amplitude modulation. Special amplitude modulation procedures.		
12	Position and frequency modulation.		
13	Applications of sampling and amplitude, frequency and phase modulation.		
14	Review. Preparation for examination.		
8.2. Applications (Seminar)		Metode de predare	Observații
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 harmonic and nonharmonic periodic signals.		
3	Spectra of impulses. Fourier transform.		
4	Linear invariant analog systems.		
5	Bode plots.		
6	Sampled signals.		
7	Modulated signals.		
8.3. Applications (laboratory)		Metode de predare	Observații
1	Introduction into OrCAD.	Didactic and experimental proof, didactic exercise, team work	Use of Orcad software
2	Spectrum of periodic signals.		
3	Spectrum of periodic square wave.		
4	First order systems.		
5	Sampled signals.		
6	Amplitude modulated signals.		
7	Lab recovery and finalization of laboratory activity.		
<b>Bibliography</b> <ol style="list-style-type: none"> <li>1. Victor Popescu – <i>Semnale, circuite și sisteme. Teoria semnalelor</i>, Editura Casa Cărții de Știință, Cluj-Napoca, 2001.</li> <li>2. Marina Dana Țopa – <i>Semnale, circuite și sisteme. Teoria sistemelor</i>, Editura Casa Cărții de Știință, Cluj-Napoca, 2002.</li> <li>3. Ioana Sărăcuț, Erwin Szopos, Victor Popescu – <i>Teoria semnalelor. Culegere de probleme</i>, Editura U.T. Press, Cluj-Napoca, 2010.</li> <li>4. Ioana Sărăcuț, Victor Popescu – <i>Teoria semnalelor. Culegere de grile</i>, Editura U.T. Press, Cluj-Napoca, 2010.</li> </ol>			

5. Ioana Popescu, Erwin Szopos, Victor Popescu, Marina Dana Țopa – *Semnale, circuite și sisteme. Indrumător de laborator IV*, Editura Casa Cărții de Știință, Cluj-Napoca, 2003.  
 6. pagina web a disciplinei prezentări curs, lucrări de laborator):  
[http://www.bel.utcluj.ro/scs/rom/ts\\_main.html](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

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	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		The level of acquired theoretical knowledge.		4 written tests TC (20p)		Max 20%
Seminar		The level of acquired skills and abilities		4 written tests TS (20p)		Max 20%
Laboratory		The level of acquired skills and abilities		4 written tests TL (20p)		Max 20%
Examen		The level of acquired theoretical knowledge, of skills and abilities		Written examination E (50p): theory (20p) and problems (30p)		Max 50%
Final mark = (TC+TS+TL+E)/10						
10.4 Minimum standard of performance						
TC+TS+TL>20p si E>20p						

Date of filling in  
1.10.2018

Course responsible  
Prof. Marina Țopa, PhD

Teachers in charge of applications  
Assist. Prof. Ervin Szopos, PhD