

SYLLABUS

1. Program information

1.1 Higher education 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 Study program / Qualification	Electronic engineering, telecommunications and information technologies/ Engineer
1.7 Form of education	IF – full-time education

2. Course information

2.1 Course title	Signals and Systems			Course code	17.00
2.2 Course coordinator	Lecturer Ioana Sărăcuț, PhD eng., loana.Saracut@bel.utcluj.ro				
2.3 Seminar/ laboratory/ project/ practical activity coordinator	Lecturer Ioana Sărăcuț, PhD eng., loana.Saracut@bel.utcluj.ro				
2.4 Year of study	II	2.5 Semester	1	2.6 Type of assessment	E
2.7 Course status	Formative category				DD
	Optionality				DOB

3. Estimated total time

3.1 Hours per week	4	of which:	3.2 Lecture	2	3.3 Seminar	1	3.3 Laboratory	1	3.3 Project		3.3 Practical training	
3.4 Hours per semester	56	of which:	3.5 Lecture	28	3.6 Seminar	14	3.6 Laboratory	14	3.6 Project		3.3 Practical training	
3.7 Time distribution (hours per semester) for individual study and assessment:												
(a) Assessment											28	
(b) Study using textbook, course materials, bibliography, and notes											14	
(c) Additional documentation in the library, on specialized electronic platforms, and in the field											8	
(d) Preparation for seminars/laboratories, assignments, reports, portfolios and essays											12	
(e) Tutoring											3	
(f) Other activities											4	
3.8 Total hours of individual study and assessment (sum of (3.7(a))...(3.7(f)))									69			
3.9 Total hours per semester (3.4+3.8)									125			
3.10 Number of credits									5.0			

4. Prerequisites (where applicable)

4.1 curriculum	Knowledge acquired in mathematics course and circuit theory course.
4.2 competencies	Mathematical notions: complex numbers, Laplace transform, trigonometry, Fourier transform, Laplace transform, computation of simple integrals. Relations and theorems for electric circuits.

5. Requirements (where applicable)

5.1. for the development of the lecture	
5.2. for the development of the seminar/ laboratory/ project	Laboratory, Cluj-Napoca

6. Specific competencies acquired

Professional competencies	C1 Use of fundamental elements related to electronic devices, circuits, systems, instrumentation and technology C1.1 Description of the operation of electronic devices and circuits and of the fundamental methods for measuring electrical quantities C1.2 Analysis of low-/medium-complexity electronic circuits and systems for their design and measurement C1.4 Use of electronic instruments and specific methods to characterize and evaluate the performance of electronic circuits and systems C2 Application of basic methods for signal acquisition and processing C2.1 Time-domain, spectral and statistical characterization of signals C2.2 Explanation and interpretation of signal acquisition and processing methods C2.3 Use of simulation environments for signal analysis and processing C2.4 Use of specific methods and instruments for signal analysis C3 Application of basic knowledge, concepts and methods related to computer-system architecture, microprocessors, microcontrollers, programming languages and techniques C3.1 Description of the operation of a computer system, of the basic principles of general-purpose microprocessor and microcontroller architecture, and of the general principles of structured programming C4 Design and use of low-complexity hardware and software applications specific to applied electronics C4.1 Definition of the concepts, principles and methods used in: computer programming, high-level and specific languages, CAD techniques for creating electronic modules, microcontrollers, computer-system architecture, programmable electronic systems, graphics and reconfigurable hardware architectures C4.2 Explanation and interpretation of the requirements specific to hardware and software structures in the fields of: computer programming, high-level and specific languages, CAD techniques for creating electronic modules, microcontrollers, computer-system architecture, programmable electronic systems, graphics and reconfigurable hardware architectures C4.4 Use of appropriate performance criteria to evaluate, including by simulation, the hardware and software of dedicated systems or service activities using microcontrollers or low-/medium-complexity computer systems
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Transversal competence	
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7. Expected learning outcomes

Knowledge	- The student/graduate explains and interprets theoretical and experimental results in mathematics, physics, chemistry, economics, technical drawing and computer science. - The student/graduate describes, identifies and summarizes elementary concepts and methods for signal acquisition, analysis and processing, implemented in systems with general-purpose processors or signal processors, as well as their application in concrete problems.
Skills	- The student/graduate applies evaluation criteria and methods for identifying, modelling, experimenting, analysing and qualitatively and quantitatively assessing phenomena and processes specific to the fundamental field, including by using digital technologies. - The student/graduate uses specific methods and tools for characterizing signals in the time domain and frequency domain and performs the acquisition, analysis and digital processing of analog signals. - The student/graduate designs, measures, evaluates performance, diagnoses and troubleshoots low/medium-complexity functional blocks for digital signal analysis and processing, using dedicated simulation environments (Matlab, Python, etc.).
Responsibility and autonomy	- The student/graduate shows initiative and proactivity in updating professional, economic and organizational culture knowledge.

8. Course objectives (based on the grid of specific competencies acquired)

8.1 General objective of the course	The development of the skills regarding the study of signals and systems.
8.2 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. Development of skills and abilities for the analysis of time-continuous linear time-invariant systems.

9. Contents

9.1 Lecture	No. of hours	Teaching methods	Remarks
Introduction into <i>Signals and Systems</i> . Classification of signals. Basic operations of signals. Harmonic signals.			

9.1 Lecture	No. of hours	Teaching methods	Remarks
Continuous time periodic signals. Non-harmonic signals. Fourier series. Properties of the Fourier series.	2		
Continuous-time aperiodic signals. Fourier transform.	2		
Properties of the Fourier transform. Ideal filters.	2		
Classification of systems. Description of linear invariant time systems: differential equation, impulse response, transfer function. Laplace transform.	2		
Description of linear invariant time systems: step response, frequency response.	2		
Applications of LTI systems.	2		
Bode plots.	2		
Discrete-time periodic signals. Discrete-time Fourier series. Discrete-time aperiodic signals. Discrete-time Fourier transform.	2		
Description of linear invariant time-discrete systems: difference equation, unit impulse response, transfer function.	2		
Signals sampling. Sampling theorem. Spectral analysis of sampled signals. Reconstruction of time-continuous signals.	2		
Amplitude modulation. Special amplitude modulation procedures.	2		
Phase and frequency modulation.	2		
Review. Preparation for examination.	2		
Bibliography			

9.2 Seminar /laboratory /project /practical training	No. of hours	Teaching methods	Remarks
Seminary classes		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.
Introduction into signal theory. Complex numbers. Sinusoidal signals.	2		
Spectra of periodic time-continuous signals.	2		
Spectra of aperiodic time-continuous signals.	2		
Linear invariant systems.	2		
Bode plots.	2		
Spectra of discrete-time signals. Sampled signals.	2		
Modulated signals.	2		
Laboratory classes			
Introduction to Matlab.	2		
Signals and Spectra.	2		
Continuous-Time Periodic Signals.	2		
The Fourier Transform.	2		

9.2 Seminar /laboratory /project /practical training	No. of hours	Teaching methods	Remarks
Continuous-Time Systems.	2		
Discrete-Time Signals and Systems.	2		
Lab recovery of laboratory activity.	2		
Bibliography Weekly homework problems, submitted by email.			

10. Alignment of the course contents with the expectations of the epistemic community, professional associations, and representative employers in the field related to the program

The course content and the teaching-learning-assessment methods are aligned with the current requirements of the Electronics, Telecommunications, and Information Technology Engineering field, considering the expectations of the academic and professional community, representative employers, as well as the national quality assurance standards in higher education. The course helps prepare students in line with employer expectations and the quality requirements set for engineering study programs.

11. Assessment

Activity type	11.1 Assessment criteria	11.2 Assessment methods (and type of assessment: continuous/ summative)	11.3 Weight in final grade
11.4 Lecture	The level of acquired theoretical knowledge	2 written tests (30p) – TC	Max 30%
11.5 Seminar/ Laboratory/ Project /Practical activity	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			
11.6 Minimum performance standard TC+TL > 20p and E > 25p			

Completion date:	Course coordinators	teaching rank, title First name LAST NAME	Signature
23.06.2026	Lecture	Lecturer Ioana Sărăcuț, PhD eng.	
	Applications	Lecturer Ioana Sărăcuț, PhD eng.	

Approval of the Head of the Department coordinating the course, only if this differs from the department organizing the study program

Head of the

Date of approval by the Council of the Department of Bases
of Electronics

26.06.2026

Head of the Bases of Electronics
Department
Prof. Sorin HINTEA, Ph.D.

Date of approval by the Council of the Faculty of Electronics,
Telecommunications and Information Technology

30.06.2026

Dean,
Prof. Ovidiu-Aurel POP, Ph.D.