Universitatea Naţională de Ştiinţă şi Tehnologie Politehnica Bucureşti
Facultatea de Electronică, Telecomunicaţii şi
Tehnologia Informaţiei

COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	**National University of Science and Technology Politehnica Bucharest**
1.2 Faculty	**Electronics, Telecommunications and Information Technology**
1.3 Department	**Telecommunications**
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of studies	Bachelor/Undergraduate
1.6 Programme of studies	Technologies and Telecommunications Systems

2. Date despre disciplină

2.1 Course name (ro) (en)				Semnale şi sisteme 1			
2.2 Course Lecturer				Prof. Dr. Simona HALUNGA			
2.3 Instructor for practical activities				Prof. Dr. Simona HALUNGA			
2.4 Year of studies	2	2.5 Semester	I	2.6. Evaluation type	E	2.7 Course regime	Ob
2.8 Course type		D	2.9 Course code	04.D.03.O.001		2.10 Tipul de notare	Nota

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week	5	Out of which: 3.2 course	2.00	3.3 seminary/laboratory	3
3.4 Total hours in the curricula	70.00	Out of which: 3.5 course	28	3.6 seminary/laboratory	42
Distribution of time:					hours
Study according to the manual, course support, bibliography and hand notes Supplemental documentation (library, electronic access resources, in the field, etc) Preparation for practical activities, homework, essays, portfolios, etc.					66
Tutoring					2
Examinations					2
Other activities (if any):					0

3.7 Total hours of individual study	80.00
3.8 Total hours per semester	150
3.9 Number of ECTS credit points	6

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	Completion and/or passing of the following subjects: Mathematical Analysis, Special Mathematics, Fundamentals of Electrical Engineering

4.2 Results of learning	Acquire the following knowledge: Fourier series for analog and discrete signals Fourier transform for analog and discrete non-periodic signals, Fourier systems analog and discrete systems, general concepts and methods of calculating the response by the integral of convolution integral and Fourier transform

5. Necessary conditions for the optimal development of teaching activities (where applicable)

5.1 Course	The course will take place in a room equipped with a projector, computer and blackboard.
5.2 Seminary/ Laboratory/Project	The laboratory will take place in a room with specific equipment, which must include: signal generator, multimeter, oscilloscope, vobulator Compulsory attendance at seminar and laboratory hours (according to the rules internal university rules)

6. General objective *(Reffering to the teachers' intentions for students and to what the students will be thought during the course. It offers an idea on the position of course in the scientific domain, as well as the role it has for the study programme. The course topics, the justification of including the course in the currcula of the study programme, etc. will be described in a general manner)*

The course defines the basic notions and concepts of signal and systems theory. It deals with signals

and analogue and discrete systems. The course introduces the basic concepts of signal and system theory.

systems and associated general concepts are presented. Continuous-time signals and systems are analysed.

and discrete time. The aim is to develop the ability to apply the fundamentals of

signal and system concepts and signal processing methods in order to achieve

specific functions in electronics.

7. Competences *(Proven capacity to use knowledge, aptitudes and personal, social and/or methodological abilities in work or study situations and for personal and proffesional growth. They refflect the empolyers requirements.)*

Specific Competences	Demonstrates basic knowledge of signal and systems theory analogue and discrete systems. Correlates the knowledge acquired in this course with that acquired in other courses Applies in practice the knowledge acquired in the course. Applies methods and tools specific to the field of signal processing and systems to carry out the evaluation process of a situation encountered in practice and identifies solutions. Argues and analyses coherently and correctly the context of application of knowledge of the field, using key concepts of the discipline and methodology methodology. Oral and written communication in Romanian: uses specific scientific vocabulary field in order to communicate effectively, both orally and in writing. Oral and written communication in a foreign language (English): demonstrates understanding of the vocabulary related to the field in a foreign language
Transversal (General) Competences	orks as part of a team and communicates effectively, coordinating efforts with others to solve problem situations of medium complexity. Autonomy and critical thinking: ability to think in scientific terms, to search for and analyse data independently and draw and present conclusions / identify solutions. Ability to analyse and synthesise: presents acquired knowledge synthetically, following a systematic process of analysis. Respects the principles of academic ethics: in documentation work, cites correctly cite the bibliographical sources used. Applies elements of emotional intelligence in appropriate social/emotional management of real-life/academic/professional situations, demonstrating self-control and objectivity in decision-making or in stressful situations.

8. Learning outcomes *(Synthetic descriptions for what a student will be capable of doing or showing at the completion of a course. The learning outcomes reflect the student's acomplishments and to a lesser extent the teachers' intentions. The learning outcomes inform the students of what is expected from them with respect to performance and to obtain the desired grades and ECTS points. They are defined in concise terms, using verbs similar to the examples below and indicate what will be required for evaluation. The learning outcomes will be formulated so that the correlation with the competences defined in section 7 is highlighted.)*

Knowledge	*The result of knowledge aquisition through learning. The knowledge represents the totality of facts, priciples, theories and practices for a given work or study field. They can be theoretical and/or factual.* Defines and understands domain-specific concepts: spectrum of a signal, transform Fourier transform for continuous signals, discrete-time Fourier transform, properties of systems analogue and discrete systems

Skills	*The capacity to apply the knowledge and use the know-how for completing tasks and solving problems. The skills are described as being cognitive (requiring the use of logical, intuitive and creative thinking) or practical (implying manual dexterity and the use of methods, materials, tools and intrumentation).* Selects and groups relevant information in a given context. Works in teams. Develops a scientific text in the field of signals. Experimentally verifies identified solutions, solves applications practical applications.
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* Selects suitable literature sources and analyses them. Respects the principles of academic ethics by correctly citing the bibliographical sources used. Demonstrates receptiveness to new learning contexts. Demonstrates collaboration with other colleagues and teachers in carrying out teaching activities. Applies ethical/professional principles in analysing the technological impact of solutions proposed in the specialist field on the environment.

9. Teaching techniques *(Student centric techniques will be considered. The means for students to participate in defining their own study path, the identification of eventual fallbacks and the remedial measures that will be adopted in those cases will be described.)*

Based on the analysis of students' learning characteristics and their specific needs, the process

the teaching process will explore both expository (lecture, exposition) and conversational/interactive teaching methods, based on discovery learning models facilitated by direct and indirect exploration of reality (experiment, demonstration, modelling), but also action-based methods such as exercise, practical activities and problem solving.

Lectures, based on Power Point presentations or different videos that will be made available to students. Each course will begin with a review of the chapters already covered.

with a focus on the concepts covered in the last course. The presentations use pictures and diagrams, so that the information presented is easy to understand and assimilate.

This discipline covers information and practical activities designed to support students in their efforts to learning and developing optimal collaborative and communicative relationships in a supportive environment learning through discovery.

It will focus on practising active listening and assertive communication skills as well as feedback building mechanisms as ways of regulating behaviour in different situations and adapting the pedagogical approach to students' learning needs.

The ability to work in teams to solve different learning tasks will be practised.

10. Contents

COURSE		
Chapter	**Content**	**No. hours**
1	Introduction. Class subject. Definitions. Classifications. Elementary signals	2

2	Analog signals. Periodic signals. Fourier series: exponential Fourier series (EFS), Trigonometric Fourier series (SFT), Harmonic Fourier series (SFA) Signal spectrum periodic. Relationships between Fourier series coefficients. Series properties Fourier series.	5
3	Non-periodic analogue signals. Distributions as generalized signals and operations with distributions. Fourier transformation. Spectrum of non-periodic signals. Convolution and correlation analogue signals.	5
4	Systems and general concepts associated with analogue systems. Introduction and classifications. Properties of analogue and discrete-time systems. Definition of function weight for systems analogue systems. Implications of general properties on the weight function. The weight function system function for linear and time invariant analogue systems. Definitions.	4
5	Sampled signals. Sampling theorem. Sampled signal spectrum. Condition Nyquist condition. Sampled signal reconstruction.	2
6	Discrete-time signals. Discrete-time periodic signals. Fourier series and diagrams spectral diagrams.	4
7	Discrete-time non-periodic signals. Fourier transformation of signals in time discrete time. Frequency domain representations. Convolution and correlation of discrete-time signals.	4
8	Systems and general concepts associated with discrete systems. Introduction and classifications. Properties of discrete systems. Weight function, transfer function. Properties discrete systems	2
	Total:	28

Bibliography:

1) I. Constantin, "Semnale şi răspunsul circuitelor", Bucureşti, Editura BREN, 1999
2) Ad. Mateescu, N. Dumitriu, L. Stanciu, “Semnale şi sisteme. Aplicaţii în filtrarea semnalelor”, Editura Teora, 2001.
3) I. Constantin, "Semnale", Tipografia Institutului Politehnic Bucureşti, 1992
4) D. Stanomir, "Semnale şi sisteme analogice", Editura Politehnica Press, 2005.
5) D. Stanomir, "Semnale şi sisteme discrete", Editura Athena, 1997.
6) Ad. Mateescu, Al. Şerbănescu, N. Dumitriu, L. Stanciu, "Semnale, circuite şi sisteme-probleme", Editura Militară, Bucureşti, 1998.
7) I. Constantin, S. Halunga, I. Marcu, "Semnale şi sisteme-probleme", Editura Electronica 2000, Bucureşti, 2007.
8) M. Săvescu, T. Petrescu, S. Ciochină, "Semnale, circuite şi sisteme-probleme", Editura Didactică şi Pedagogică, Bucureşti,1981.
9) C. Negrescu, D. Stanomir, Semnale şi sisteme-Probleme şi soluţii, Ed. Politehnica, 2013, Bucureşti.
10) T. Petrescu, ”Semnale şi sisteme”, Ed. POLITEHNICA PRESS, Bucureşti, 2019.
11) M. D. Adams, Signals and Systems, Edition 5.0, Dec. 2022, xliv + 700 pages, ISBN 978-1-990707-00-1 (PDF).
12) Mark Wickert, Signals and Systems for dummies, Wiley, 2

LABORATORY		
Crt. no.	**Content**	**No. hours**
1	Spectral analysis of analogue periodic signals.	4
2	Introduction to Matlab	2
3	Signal convolution using Matlab	2
4	Fourier transform analysis using Matlab	4
5	Laboratory colloquium	2
	Total:	14

SEMINARY		
Crt. no.	**Content**	**No. hours**
1	Periodic analogue signals. Fourier series	4
2	Fourier analysis of non-periodic signals. Distributions	4
3	General properties of analogue systems in time and frequency. Response methods	4
4	Sampled signals and reconstruction of continuous signals.	2
5	Fourier analysis of discrete periodic signals	4
6	Fourier analysis of non-periodic analog signals	4
7	General properties of discrete time and frequency systems. Response methods	4
	Total:	28

Bibliography:

1) I. Constantin, "Semnale şi răspunsul circuitelor", Bucureşti, Editura BREN, 1999
2) Ad. Mateescu, N. Dumitriu, L. Stanciu, “Semnale şi sisteme. Aplicaţii în filtrarea semnalelor”, Editura Teora, 2001.
3) I. Constantin, "Semnale", Tipografia Institutului Politehnic Bucureşti, 1992
4) D. Stanomir, "Semnale şi sisteme analogice", Editura Politehnica Press, 2005.
5) D. Stanomir, "Semnale şi sisteme discrete", Editura Athena, 1997.
6) Ad. Mateescu, Al. Şerbănescu, N. Dumitriu, L. Stanciu, "Semnale, circuite şi sisteme-probleme", Editura Militară, Bucureşti, 1998.
7) I. Constantin, S. Halunga, I. Marcu, "Semnale şi sisteme-probleme", Editura Electronica 2000, Bucureşti, 2007.
8) M. Săvescu, T. Petrescu, S. Ciochină, "Semnale, circuite şi sisteme-probleme", Editura Didactică şi Pedagogică, Bucureşti,1981.
9) C. Negrescu, D. Stanomir, Semnale şi sisteme-Probleme şi soluţii, Ed. Politehnica, 2013, Bucureşti.
10) T. Petrescu, ”Semnale şi sisteme”, Ed. POLITEHNICA PRESS, Bucureşti, 2019.
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11. Evaluation

Activity type	11.1 Evaluation criteria	11.2 Evaluation methods	11.3 Percentage of final grade

11.4 Course	Knowledge of concepts fundamental theory of signals and systems	Control paper on a predefined date, set at the beginning semester	10
	Knowledge of how to application methods of processing of signal processing methods the achievement specific functions in electronics;	Final examination taken in exam session. Oral verification.	20
	Assessment in solving individual independent proposed problems	Final exam taken in examination session. Oral verification.	30
11.5 Seminary/laboratory/project	Knowledge of how to comparing results experimental results with theoretical	The theoretical component is assessed when verified by calculation of the results results	10
	Assessment for understanding of notions and concepts fundamental of spectral analysis of signals	Final laboratory colloquium including a component practical component and a theoretical component	20
	Assessment in solving individual independent proposed problems	The practical component is verified by assessing the ability to measure the spectrum of a signal	10
11.6 Passing conditions			
at least 50% of the laboratory grade at least 50% of the total grade			

12. Corroborate the content of the course with the expectations of representatives of employers and representative professional associations in the field of the program, as well as with the current state of knowledge in the scientific field approached and practices in higher education institutions in the European Higher Education Area (EHEA)

With a solid understanding of basic principles, innovation and development are possible. Signal

and systems theory is one of the fundamentals that will underpin research and development for years to come. Not

is easy to teach or learn. Signals and Systems combines mathematical abstraction with concrete engineering applications.

and concrete engineering applications. Advanced mathematical knowledge and maturity in engineering

engineering thinking. A Signals and Systems course needs to be designed to stimulate interest.

Students of the National University of Science and Technology - Polytechnic University of Bucharest - Faculty of Electronics,

Telecommunications and Information Technology to get them interested in applying, but at the same time to get them to appreciate the

the mathematical apparatus. The content of the course is similar to that of courses at universities in Europe and the United States.

United States with the same profile.

Date	Course lecturer	Instructor(s) for practical activities
	Prof. Dr. Simona HALUNGA	Conf. Dr. Mădălina BERCEANU, As. Drd. Maria SÎRBU-DRĂGAN
Date of department approval	Head of department	
Date of approval in the Faculty Council	Dean	