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 2			
2.2 Course Lecturer				Prof. Dr. Simona HALUNGA			
2.3 Instructor for practical activities				Conf. Dr. Mădălina BERCEANU, AS. drd. Maria SÎRBU-DRĂGAN			
2.4 Year of studies	2	2.5 Semester	2	2.6. Evaluation type	E	2.7 Course regime	Ob
2.8 Course type		D	2.9 Course code	04.D.04.O.015		2.10 Tipul de notare	Nota

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

3.1 Number of hours per week	4	Out of which: 3.2 course	2	3.3 seminary/laboratory	2
3.4 Total hours in the curricula	56	Out of which: 3.5 course	28	3.6 seminary/laboratory	28
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.					61
Tutoring					4
Examinations					4
Other activities (if any):					0

3.7 Total hours of individual study	69.00
3.8 Total hours per semester	125
3.9 Number of ECTS credit points	5

4. Prerequisites (if applicable) (where applicable)

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

4.2 Results of learning	Accumulate the following knowledge: Fourier series, Fourier transform, Fourier transform Laplace transform, Z transform, characterisation of systems. Quadripoles

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 video 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 (according to the rules of the 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)*

- methods of analysing signals and analogue systems using the Laplace transform. Stability analysis

systems. Laplace method and compact method

- methods of analysis of signal-model and discrete systems using the z-transform. Response calculation

systems using the z-transform. Implementation of discrete systems in direct form 1, direct form 2 and

canonical form

- the diport formalisms. Characterization by matrices, Z, Y, h, g, A, B. Interconnection of the diports.

- Signal graphs. Calculation of the transfer function using signal graphs.

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 systems analysis analogue and discrete-time 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 systems analysis and circuits, 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.

Transversal (General) Competences	Works 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

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.* - Can use the Laplace transform to characterise analogue signals. Define stability conditions. Calculates the response to non-periodic analogue signals using the Laplace method and to periodic analogue signals by the compact method. -- Can use the z-transform to characterise discrete signals. Defines the conditions of stability and causality conditions. Calculates the response to non-periodic analogue signals by the Laplace method. Implements direct form 1, 2 and canonical filters. - is able to describe with matrix parameters a diport, is able to determine the transfer function of a system by means of signal graphs and Mason's rule
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. Produces a scientific text in the field of systems. Experimentally verifies identified solutions, solves practical applications. Selects sources bibliographic sources and analyses them. Respects the principles of academic ethics, 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
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.

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

assimilated. This subject covers information and practical activities designed to support students in

learning efforts and the development of optimal collaborative and communicative relationships in an environment

conducive to discovery learning.

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.

10. Contents

COURSE		
Chapter	**Content**	**No. hours**
1	Bilateral and unilateral Laplace transform. Properties of the unilateral Laplace transform	6
2	Laplace method for calculating the system response to analog signals non-periodic. The compact method for calculating the system envelope and at periodic analog signals	5
3	Z transform for discrete non-periodic signals. Convergence domains. Properties.	6
4	General methods of discrete-time systems analysis. Convolution methods, method finite difference equations and constant coefficients. Methods of analysis with Implementation of discrete systems direct form 1, 2 and canonical form	5
5	Analysis of quadripoles. Matrix analysis. Ideal quadripoles models. Analysis of quadripoles passive: image parameters, working parameters.	6

	Total:	

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 și sisteme”, Ed. POLITEHNICA PRESS, București, 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, 2013

LABORATORY

Crt. no.	Content	No. hours
1	Laplace transform in Matlab programming environment	2
2	Discrete-time signals in Matlab programming environment	2
3	Systems response to signals using breadbord	4
4	Parameters of the quadripoles using the breadboard	4
5	Final colloquium	2
	Total:	14

SEMINARY

Crt. no.	Content	No. hours
1	Laplace transform for non-periodic analogue signals	2
2	Laplace and compact methods for calculating the response of analogue systems	2
3	Z transform for discrete non-periodic signals	2
4	Discrete systems response. Implementation of discrete systems.	2
5	Matrix parameters of quadrupoles.	2
6	Image and working parameters of passive quadrupoles. The bisection theorem	2
7	Fluence graphs signals study	2
	Total:	14

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 date set at start semester	10
	Knowledgeof the application of processing methods in the achievement specific functions in electronics;	Partial examination taken in examination 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	Understanding of notions and concepts fundamental of spectral analysis of signals	Final laboratory colloquium including theoretical and practical components	20
	Knowledge of how to compare the experimental results with theoretical ones, deduced via computation	Assessment in solving individual independent proposed problems Practical component is checked by assessment measurement skills	10
	Assessment in solving individual independent proposed problems	Practical component is checked by assessment measurement skills a the spectrum of a signal	10
11.6 Passing conditions			
50% of the lab 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)

The course presents the theory of analog and discrete systems from a signal processing perspective, but includes

the design and analysis of analog and digital filters. The first part of the course presents the theory and

in the second part of the course the theory is exemplified through implementation. The course content

similar to courses at universities in Europe and the United States of the same profile.

Date	Course lecturer	Instructor(s) for practical activities
25.09.2025	Prof. Dr. Simona HALUNGA	Conf. Dr. Mădălina BERCEANU, AS. drd. Maria SÎRBU-DRĂGAN

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Date of department approval	Head of department
26.09.2025	Conf. Dr. Serban Georgica Obreja

Date of approval in the Faculty Council	Dean
26.09.2025	Prof. Dr. Mihnea Udrea