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	Computers and Information Technology
1.5 Cycle of studies	Bachelor/Undergraduate
1.6 Programme of studies	Information Engineering

2. Date despre disciplină

2.1 Course name (ro) (en)				Semnale şi sisteme 1 Signals and Systems 1			
2.2 Course Lecturer				Conf. Dr. Cristian-Lucian Stanciu			
2.3 Instructor for practical activities				As. Drd. Eng. Radu-Andrei Otopeleanu			
2.4 Year of studies	2	2.5 Semester	I	2.6. Evaluation type	E	2.7 Course regime	Ob
2.8 Course type		S	2.9 Course code	04.S.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.					68
Tutoring					0
Examinations					12
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	Calculus, Algebra, Special Mathematics, Fundamentals of Electrotechnics
4.2 Results of learning	Not the case.

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

5.1 Course	Not the case.
5.2 Seminary/ Laboratory/Project	Mandatory attendance at laboratories.

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 system theory. It covers analog and discrete signals and systems. The course provides the basic notions of signal theory and presents the associated general systems and concepts. Continuous-time and discrete-time signals and systems are analysed. The aim is to develop the ability to apply fundamental notions related to signal and system concepts, as well as signal processing methods in order to perform 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	Applications directly related to the concepts taught in the course are presented and supplemented with spectral analysis measurements in the laboratory. The seminar and laboratory aim to solve problems related to signals and systems in order to understand fundamental concepts and notions. The aim is to approach and, above all, solve the proposed problems individually and independently.
Transversal (General) Competences	Honorable, responsible, ethical behavior.

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.* - modeling a simple real-world signal analysis problem and specifying the processing chain required to solve it;
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).* - implementing and demonstrating the operation of a simple solution for a spectral analysis problem of interest.

Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* -

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.)*

Fourier analysis of periodic and non-periodic analog signals is performed. Elements of distribution theory related to signals and systems are presented. Convolution and correlation of analog signals and representation of analog signals by Laplace transform are presented. General concepts in analog systems theory are presented and the transfer function of linear and time-invariant analog systems is defined. Signal sampling is presented and the Fourier analysis of discrete periodical signals.

10. Contents

COURSE

Chapter	Content	No. hours
1	Introduction. Course subject. Definitions. Classifications. Basic signals.	1
2	Analog signals. Periodic signals. Fourier series. Spectrum of periodic signals. Non-periodic signals. Fourier transform. Spectrum of non-periodic signals. Laplace transform. Convolution and correlation of analog signals. Analog systems.	21
3	Sampled signals. Sampling theorem. Spectrum of sampled signals. Nyquist condition. Reconstruction of sampled signals.	2
4	Discrete-time signals. Periodic signals in discrete time. Fourier series and spectral diagrams. Non-periodic signals in discrete time.	4
	Total:	28

Bibliography:

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", Editura Electronica 2000, Bucureşti, 2007.
8) M. Săvescu, T. Petrescu, S. Ciochină, "Semnale, circuite şi sisteme-probleme", Editura Didactică şi Pedagogică, Bucureşti,1981.

LABORATORY

Crt. no.	Content	No. hours
1	Lab 1 –to MATLAB for signal processing	2
2	Lab 2 – Periodic signals	4
3	Lab 3 – Signal convolution	2
4	Lab 4 – Fourier transform using MATLAB	3
5	Lucrarea 5 – System response using MATLAB -Simulink	1
6	Examination	2
	Total:	14

SEMINARY

Crt. no.	Content	No. hours
1	General properties of signals. Periodic analog signals.	2
2	Fourier analysis of periodic signals.	3
3	Fourier analysis of non-periodic signals. Distributions.	4
4	Convolution and correlation of analog signals.	4
5	Signal analysis with Laplace transform.	6
6	General properties of analog systems.	4
7	Sampled signals and reconstruction of continuous signals.	2
8	Fourier series in discrete time.	3
	Total:	28

Bibliography:

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.
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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", Editura Electronica 2000, Bucureşti, 2007.
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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 the fundamental concepts of signal and systems theory; -knowledge of how to apply signal processing methods to perform specific functions in electronics;	-Control work submitted on the date set at the beginning of the semester. - Final exam taken during the exam session.	60
11.5 Seminary/laboratory/project	-appreciation for individual, independent problem solving; -appreciation for understanding fundamental notions and concepts of spectral signal analysis; - knowledge of how to measure spectral components for periodic analog signals and for amplitude and frequency modulated signals with harmonic carriers; - knowledge of how to compare experimental results with theoretical ones.	- assessment in solving problems during seminar classes; - assessment in solving homework problems; - assessment in solving problems in a seminar test; Final laboratory colloquium, comprising a practical component and a theoretical component. The practical component is assessed by evaluating the ability to measure the spectrum of a signal; The theoretical component is assessed by verifying the experimental results through calculation.	40
11.6 Passing conditions			
>= 50 % points			

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)

Innovation and development are possible through a solid understanding of basic principles. Signal and systems theory is one of the foundations that will be the basis for research and development in the coming years.

It is not easy to learn or teach signals and systems, due to the combination of mathematical abstraction and concrete engineering applications. It requires sophistication in mathematics and maturity in engineering. A course in Signals and Systems needs to be designed to increase students' interest in applications, but also to make them appreciate mathematical tools.

Date	Course lecturer	Instructor(s) for practical activities
25.09.2025	Conf. Dr. Cristian-Lucian Stanciu	As. Drd. Eng. Radu-Andrei Otopeleanu

Universitatea Națională de Știință și Tehnologie Politehnica București

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Date of department approval	Head of department
	Conf. Dr. Ing. Serban Obreja
Date of approval in the Faculty Council	Dean
26.09.2025	Prof. Dr. Mihnea Udrea