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	**Applied Electronics and Information Engineering**
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of studies	Bachelor/Undergraduate
1.6 Programme of studies	Applied Electronics

2. Date despre disciplină

2.1 Course name (ro) (en)				Sisteme electronice programabile Programable Electronic Systems			
2.2 Course Lecturer				S.l./Lect. Dr. Bogdan Alexandrescu			
2.3 Instructor for practical activities				S.l./Lect. Dr. Dragos Sacaleanu			
2.4 Year of studies	4	2.5 Semester	I	2.6. Evaluation type	V	2.7 Course regime	Op
2.8 Course type		S	2.9 Course code	04.D.07.O.107		2.10 Tipul de notare	Nota

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

3.1 Number of hours per week	3	Out of which: 3.2 course	2.00	3.3 seminary/laboratory	1
3.4 Total hours in the curricula	42.00	Out of which: 3.5 course	28	3.6 seminary/laboratory	14
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.					75
Tutoring					0
Examinations					8
Other activities (if any):					0

3.7 Total hours of individual study	33.00
3.8 Total hours per semester	75
3.9 Number of ECTS credit points	3

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	Completion and/or promotion of the following disciplines:- Architecture of microprocessors- Microcontrollers - Digital Signal Processing

4.2 Results of learning	Knowledge of HW and SW architecture of digital signal processors, basic knowledge of programming in assembly language, implementation of digital signal processing algorithms on systems with programmed logic, use of simulation programs - LabVIEW.

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 and blackboard.
5.2 Seminary/ Laboratory/Project	The laboratory will take place in a room with specific equipment, which must include PCs with the LabVIEW development environment. Development boards with programmable signal processors using the LabVIEW development environment (eg Speedy-33 from National Instruments) are also required. Attendance at the laboratories is mandatory according to UPB regulations

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 discipline familiarizes students with the basic concepts regarding the hardware and software architecture of programmable systems with digital signal processors, with the design of electronic computing systems with digital signal processors and with their use for the implementation of digital signal processing algorithms. Representative families of digital signal processors and case studies are presented comparatively.

The applications study the implementation of algorithms in simulationmode of a demonstration system with the digital signal processor in Labview or with the development board with the TMS320C3x signal processor (Speedy-33 - National Instruments). HW architecture and how to use the LabVIEW programming module are studied. Students will design, implement and test algorithms for digital processing of one and two-dimensional signals. Students will model processing systems and perform programming using the LabVIEW graphical programming environment

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 digital signal processors. Implements procedures of medium complexity on signal processors.Apply basic knowledge, concepts and methods regarding the architecture of computing systems, microprocessors, microcontrollers, programming languages and techniquesExplains and interprets signal acquisition and processing methods and the structure and operation of general-purpose microprocessor and microcontroller computing architectures.It applies in practice and realizes projects involving hardware (signal processors) and software (programs).It argues and analyzes coherently and correctly the context of application of the basic knowledge of programmable electronic systems.Oral and written communication in Romanian: uses the scientific vocabulary specific to the field, in order to communicate effectively, in writing and orally. Oral and written communication in a foreign language (English): demonstrates understanding of subject-related vocabulary in a foreign language.

Transversal (General) Competences	Methodical analysis of the problems encountered in the activity, identifying the elements for which there are established solutions, thus ensuring the fulfillment of professional tasks.Realization of projects in a team with project management and quality assurance for solving problems of medium complexity.Autonomy and critical thinking: the ability to think in scientific terms, search and analyze data independently, and draw and present conclusions / identify solutions. Ability to analyze and synthesize: presents the acquired knowledge in a synthetic way, as a result of a process of systematic analysis.

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.* List and characterize types of signal processors.Lists types of instructions used in programmable electronic systems.Defines domain-specific notions.Describes microprocessor computing architectures.Highlights the basic features of programmable electronic systems.It applies the basic signal processing methods used in signal processors.It implements some procedures of medium complexity on signal processors. Apply knowledge, concepts and elementary methods of programming languages and techniques.
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).* Select and group relevant information in a given context.Work productively in a team.Experimentally verify identified solutions.Solve practical applications.Interpret causal relationships appropriately.Identifies solutions and develops resolution/project plans.Formulate conclusions to the experiments carried out. Argue the identified solutions.
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* Demonstrates responsiveness to new learning contexts.Demonstrates collaboration with other colleagues and teaching staff in carrying out teaching activitiesDemonstrates autonomy in organizing the learning situation/context or the problem situation to be solvedPromotes/contributes through new solutions related to the specialized field to improve the quality of social life. Respect the principles of academic ethics, correctly citing the bibliographic sources used.

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.)*

Within this discipline, considering both the course hours and those of applications, both expository (lecture, exposition) and conversational-interactive teaching methods will be used, based on discovery learning models facilitated by the direct and indirect exploration of reality (experiment, demonstration, modelling), but also on action-based methods, such as exercise, practical activities and problem solving.In the teaching activity, lectures will be used, based on some Power Point presentations. Presentations use images and

diagrams so that the information presented is easy to understand and assimilate.

Active listening and assertive communication skills will be considered, as well as feedback construction mechanisms. Teamwork skills will be practiced to solve different learning tasks

10. Contents

LABORATORY		
Crt. no.	**Content**	**No. hours**
1	Study of the HW structure of the Speedy-33 demonstrationsystem. Identification of I/O interfaces. Simple applications: conversion of analog A/D and D/A signals. Representationand display of signals in thetimeandfrequencydomains.	2
	Total:	14

Bibliography:

B. Alexandrescu, Programable Electronic Systems, suport de curs electronic, https://curs.upb.ro/2024/course/view.php?id=7171
B. Alexandrescu, Sisteme electronice programabile – Note de curs (2021)
V. Lazarescu, Sisteme electronice programabile – Note de curs (2019, 2020)
P. Lapsley, J. Bier, A. Shoham, DSP Processor Fundamentals. ArchitecturesandFeatures, Ed. IEEE Press, NY.
Sen M. Kuo, Woon-Seng S. Gan, Digital Signal Processors: Architectures, Implementations, and Applications, Ed. Prentice-Hall.
https://www.ni.com

11. Evaluation

Activity type	11.1 Evaluation criteria	11.2 Evaluation methods	11.3 Percentage of final grade
11.4 Course			60%
11.5 Seminary/laboratory/project			40%
11.6 Passing conditions			
Obtaining 50% of the total score. Obtaining 50% of the score related to the laboratory activity.			

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)

Digital signal processing systems have replaced traditional analog processing systems. Two factors contributed to this evolution: the appearance and development of microprocessors and the development of efficient algorithms for digital processing. Currently, digital systems cover a wide range of applications in fields such as: medicine, consumer electronics, telecommunications, robotics, measurement systems, command and control, transport, the military field, etc. In the "digital era" there is a great demand for qualified engineers, specialized in the design, manufacture and use of digital systems, who also possess a solid knowledge base in electronics, systems theory, information technology so that they are able to develop new hardware systems and software applications. .

The curriculum of the discipline responds concretely to these current development and evolution requirements, subscribed to the European economy of services in the field of Electronic Engineering, Telecommunications and Information Technology. In the context of the current technological progress of electronic devices, the fields of activity targeted are practically unlimited, from "consumer" applications (digital camera technologies, mobile "smart-phone" terminals), the medical field (products and technologies for analysis and medical image processing), military field (remote sensing products and satellite image processing technologies), security field (surveillance systems and biometric systems), industrial automation field (product inspection systems), robotics (systems of human-machine interface) and others.

The SEP discipline provides graduates with adequate skills to meet the needs of current qualifications and a modern, high-quality and competitive scientific and technical training, which will allow them to be employed quickly after graduation, being perfectly aligned with the policy of the Politehnica University of Bucharest, both from the point of view of content and structure, as well as from the point of view of the skills and international openness offered to students.

Date	Course lecturer	Instructor(s) for practical activities
	S.l./Lect. Dr. Bogdan Alexandrescu	Ş.L. Dr. Ing. Dragoş-Ioan SĂCĂLEANU
Date of department approval	Head of department	
Date of approval in the Faculty Council	Dean	