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	**Electronic Devices, Circuits and Architectures**
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of studies	Bachelor/Undergraduate
1.6 Programme of studies	Microelectronics, Optoelectronics and Nanotechnologies

2. Date despre disciplină

2.1 Course name (ro) (en)				Automatizări în electronică şi telecomunicaţii Automatic Control in Electronics and Telecommunications			
2.2 Course Lecturer				Prof. dr. ing. Dan Alexandru Stoichescu			
2.3 Instructor for practical activities				Conf. dr. ing. Bogdan Cristian Florea			
2.4 Year of studies	3	2.5 Semester	I	2.6. Evaluation type	V	2.7 Course regime	Op
2.8 Course type		D	2.9 Course code	04.D.05.A.020		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	3.3 seminary/laboratory	1
3.4 Total hours in the curricula	42	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.					29
Tutoring					0
Examinations					4
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 passing of the following courses: Mathematical Analysis 1 and 2; Physics 1 and 2; Basics of Electrotechnics 1 and 2; Electronic Devices; Fundamental Electronic Circuits; Analog Integrated Circuits

4.2 Results of learning	Acquisition of the following knowledge: Laplace Transform, Kirchhoff's Theorems

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, as well as a blackboard and chalk.
5.2 Seminary/ Laboratory/Project	The laboratory will take place in a room with specific equipment, which must include: - modules for examining the automatic control of temperature, lighting, the level and flow rate of a liquid, pressure, and the rotational speed of an electric motor - instruments for measuring voltage and electric current

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)*

This course is studied within the field of Electronic Engineering, Telecommunications and Information Technology / specialization Applied Electronics and aims to familiarize students with the basic elements of automatic control systems theory, both in analysis and in synthesis. Students are taught modeling methods of physical systems using transfer functions and state variables, stability criteria for automatic control systems, as well as steady-state and transient performance; in the last part of the course, concepts related to the design of automatic control systems are presented. With the acquired knowledge, students can solve specific problems and tackle applications in the field. The course is designed to stimulate the learning process in students.
The discipline addresses basic elements that are essential in the training of any engineer specialized in electronics and telecommunications.

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 possession of** basic knowledge in the field of automatic control **Correlates knowledge** **Applies** standardized methods and tools specific to the field to carry out the process of evaluation and diagnosis of a situation, according to identified problems, and finds solutions. **Argues and analyzes** coherently and correctly the context for applying the basic knowledge of the field, using key concepts of the discipline and specific methodology. **Oral and written communication in Romanian:** uses the scientific vocabulary specific to the field for effective written and oral communication.

Transversal (General) Competences	**Autonomy and critical thinking:** the ability to think in scientific terms, to search for and analyze data independently, and to draw and present conclusions / identify solutions. **Capacity for analysis and synthesis**: presents the acquired knowledge in a synthetic manner, as a result of a systematic analysis process. **Respects the principles of academic ethics:** correctly cites the bibliographic sources used in documentation. Methodically analyzes problems encountered in activity, identifying elements for which established solutions exist, thus ensuring the fulfillment of professional tasks.

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.* Knowledge regarding the analysis of automatic control systems: Modeling of electrical, mechanical, electromechanical, thermal, and hydraulic systems using transfer functions and state variables; Equivalence of block diagrams of automatic control systems; Calculation of the response of automatic control systems to standard signals; Determination of the stability of automatic control systems, stability criteria; Steady-state and transient performance of automatic control systems. Knowledge regarding the synthesis of automatic control systems Design of automatic control systems using the pole-zero method Design of automatic control systems using PID controllers
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. **Uses, with justification, specific principles for** modeling physical systems and synthesizing automatic control systems of medium complexity. **Experimentally verifies** identified solutions. **Solves** practical applications. **Properly interprets** causal relationships. **Analyzes and compares.** **Formulates** conclusions for the experiments performed. **Argues** the identified solutions / approaches to solving problems.

Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* **Selects** suitable bibliographic sources and analyzes them. **Respects the principles of academic ethics,** correctly citing the bibliographic sources used. **Demonstrates receptiveness** to new learning contexts. **Shows collaboration** with other colleagues and teaching staff in carrying out didactic activities. **Demonstrates autonomy** in organizing the learning situation/context or the problem situation to be solved.

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.)*

Starting from the analysis of students' learning characteristics and their specific needs, both expository teaching methods (lecture, presentation) and conversational-interactive methods based on discovery learning models (experiment, demonstration, modeling) are used, as well as action-based methods such as exercises, practical activities, and problem solving.
In teaching, lectures are used, based on PowerPoint presentations. Each course begins with a recap of the chapters covered in the previous class.
The presentations use images and diagrams so that the information presented is easy to understand and assimilate.
Practicing active listening and assertive communication skills is envisaged, as well as feedback-building mechanisms, as ways to adapt the pedagogical approach to students' learning needs.

10. Contents

COURSE		
Chapter	**Content**	**No. hours**
1	Chapter 1 – Introduction. General elements: - definitions, the block diagram of an automatic system; - automatic command systems and automatic control (regulation) systems; - classification of automation systems	2
2	Chapter 2 – The functional (input-output) model of a linear time-continuous automatic system (SALC), - analysis of SALC using differential equations; - transfer functions of single-input single-output and multivariable SALC; transfer functions of electrical, mechanical, electromechanical, and thermal systems – examples; - transfer functions and electrical schematics of electronic controllers; - analysis of SALC in the frequency domain.	6
3	Chapter 3 – The structural-functional model (using state variables) of a SALC - state variables; state and output equations of the structural-functional model; - equivalence between the functional model and the structural-functional model of a SALC; examples; - determination of the structural-functional model of electrical, mechanical, and electromechanical physical systems; examples. - determination of the SALC response using the structural-functional model	6

4	Chapter 4 – SALC performance: - definition of SALC performance in the time domain; response of a SALC to a unit step input; - definition of SALC performance in the frequency domain; - SALC stability; Routh–Hurwitz and Nyquist stability criteria.	6
5	Chapter 5 – SALC synthesis: - definition of SALC performance in the time domain; response of a SALC to a unit step input; - definition of SALC performance in the frequency domain; - SALC stability; Routh–Hurwitz and Nyquist stability criteria; assessment of stability using the state-space model	6
6	Chapter 6 – Component blocks of SALC: - transducers (sensors): definition, classifications, characteristic performance, examples; - adapters (circuits for the transducers' output signal): role, examples - electronic controllers: structure, examples	2
	Total:	28

Bibliography:
Stoichescu Dan Alexandru: Controlul automat în electronică şi telecomunicaţii – curs în format electronic pe Moodle
2. Stoichescu Dan Alexandru: Echipamente electronice de reglaj automat, Printech, Bucureşti, 2014
Stoichescu D.A, Vasile D Sisteme automate – culegere de probleme, UPB, Bucureşti, 1998

LABORATORY

Crt. no.	Content	No. hours
1	Automatic control of temperature	2
2	Automatic control of lighting	2
3	Automatic control of the level of a liquid	2
4	Automatic control of liquid flow2	2
5	Automatic control of pressure	2
6	Automatic control of the position and speed of an electric motor	2
7	Final laboratory colloquium	2
	Total:	14

Bibliography:
Stoichescu Dan Alexandru: Controlul automat în electronică şi telecomunicaţii – curs în format electronic pe moodle
Stoichescu D.A., Vasile D: Sisteme automate, UPB, Bucureşti, 2014
Electronica Venetta: TEACHER/STUDENT handbooks of modules MCM-12/EV, MCM-12A/EV, MCM-12B/EV, MCM-12C/EV

11. Evaluation

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

11.4 Course	- knowledge of methods for analyzing automatic systems using transfer functions and state equations;	two extensive verification tests during the semester held on dates set at the beginning of the semester; the subjects cover the taught material and consist of theoretical questions and problems that require in-depth knowledge of the course.	70%
	- familiarization with the role, structure, and operation of representative elements of an automatic control system.	Several short assignments of 5–10 minutes at the end of some courses	10%
11.5 Seminary/laboratory/project	- knowledge of the theory underlying the experiments carried out in the laboratory; - familiarization with the electronic circuits in the structure of the modules; - the ability to carry out the experiments from the platform sheets with the modules available in the laboratory.	Short questions regarding the theoretical basis of the laboratory works and the experiments carried out during the laboratory	20%
11.6 Passing conditions			
Obtaining 50% of the total score. Obtaining 50% of the score related to the laboratory.			

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)

Automatic control systems, implemented in most cases with electronic circuits, have been developed to improve production processes, but today they are found in areas far removed from industry: the same methods and, sometimes, the same types of circuits serve to control motors or to monitor pulse rate. In medicine, transportation, telecommunications, robotics, and radar, automatic control is ubiquitous. None of its applications can be realized, however, without knowledge of the basic concepts and principles.
The course syllabus concretely addresses this need: in the first part, the concepts specific to the discipline are rigorously defined and the methods related to the modeling and calculation of the physical systems that make up the automation chain and the automatic control systems themselves are thoroughly explained, always with the help of illustrative examples; in the second part, the performance of automation systems is defined and the basic methods for the synthesis of these systems are developed; at the end, the role, characteristic features, and structure of the blocks that form part of automatic control systems are presented.
The course is designed and delivered so as to make future graduates capable of tackling any more complex problem related to automatic control.

Universitatea Naţională de Ştiinţă şi Tehnologie Politehnica Bucureşti

Facultatea de Electronică, Telecomunicaţii şi

Tehnologia Informaţiei

Date	Course lecturer	Instructor(s) for practical activities
19.09.2025	Prof. dr. ing. Dan Alexandru Stoichescu	Conf. dr. ing. Bogdan Cristian Florea

Date of department approval	Head of department
	Prof. Dr. Claudius Dan
Date of approval in the Faculty Council	Dean
	Prof. dr. ing. Radu Mihnea Udrea