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	Networks and Telecommunications Software

2. Date despre disciplină

2.1 Course name (ro) (en)				Componente și circuite pasive			
2.2 Course Lecturer				S.l./Lect. Dr. Cristina Ioana Marghescu			
2.3 Instructor for practical activities				S.l./Lect. Dr. Cristina Ioana Marghescu, Conf.dr.ing. Andrei Drumea			
2.4 Year of studies	2	2.5 Semester	1	2.6. Evaluation type	E	2.7 Course regime	Ob
2.8 Course type		D	2.9 Course code	04.D.03.O.004		2.10 Tipul de notare	Nota

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

3.1 Number of hours per week	3.5	Out of which: 3.2 course	2	3.3 seminary/laboratory	1.5
3.4 Total hours in the curricula	49	Out of which: 3.5 course	28	3.6 seminary/laboratory	21
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.					47
Tutoring					0
Examinations					4
Other activities (if any):					0

3.7 Total hours of individual study	51.00
3.8 Total hours per semester	100
3.9 Number of ECTS credit points	4

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	Physics, Mathematical Analysis, Basic Electrotechnics.
4.2 Results of learning	Not needed.

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

5.1 Course	The course takes place in a room with a videoprojector and screen.

5.2 Seminary/ Laboratory/Project	The laboratory will take place in a room with equipment specific to an electronics laboratory, e.g. RLC-meter, oscilloscope, digital multimeter, signal generator, power supplies, computer.

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 general objective of the Passive Components and Circuits course is to provide future electronics engineers with in-depth knowledge of both discrete and integrated passive components. With a strong practical focus, the curriculum covers the characterization, design, modeling, simulation, measurement, and application of passive electronic elements within today's discrete and integrated technologies that underlie high-tech products. The aim is to familiarize students with the types of modern passive components and their key parameters. They will also gain the ability to design and simulate circuits where it is necessary to identify and select the appropriate passive components for the application, andlearn the methods for simulating the behavior of passive components based on the models from the data sheets. The lab covers applications for calculating relevant parameters of passive components and circuits, such as: global tolerance of parameters of some passive circuits, limits of certain parameters to prevent destruction of components, self resonant frequency, choice of a certain type of component for a certain application.

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/advanced knowledge of passive components. Correlate knowledge Apply knowledge in practice It applies standardized methods and tools, specific to the field, to carry out the evaluation and diagnosis process of a situation, depending on the identified/reported problems, and identifies solutions. 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	Team work and efficient communication skills, to coordinate efforts with others to solve typical problems of medium complexity. Analysis and synthesis skills – can present in a concise manner the acquired knowledge. Respect the academic ethic principles – cite and copyright rules.

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.* Familiarization of students with the main types of linear passive components (resistors, capacitors, inductors) and non-linear (thermistors, varistors). Carrying out measurements and experiments specific to these components. Familiarizing students with the method of identifying information specific to passive components based on the study of catalog sheets. Using this information to choose a specific component for a particular application. The study of the behavior of passive components through simulation methods based on mathematical models and SPICE type simulators.
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).* Cognitive skills -Formulates conclusions to the experiments carried out. -Elaborate a scientific text. Practical skills Through its pragmatic side, being strongly oriented towards application, the laboratory of the discipline develops skills regarding the characterization by measuring the parameters of passive components. Skills are also developed to choose the components specific to an application and create the BOM file (list of components) in order to purchase the components.
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* Select and analyze suitable references Respect principles of ethic in academia by citing the sources used. Colaborate with coleagues in teaching activities. Demonstrates real-life situation management skills (collaborative vs. conflict time management).

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 the students' learning characteristics and their specific needs, both expository (lecture, exposition) and interactive teaching methods are used in the teaching process, which are based on models of discovery learning and are supported by direct and indirect exploration of reality (experiment, demonstration, modeling), but also by action-oriented methods such as exercises, practical activities and problem solving.
Lectures based on Power Point presentations or various video sequences provided to the students are used in class. Each course begins with a recap of the chapters already covered and focuses on the concepts covered in the last course. Images and diagrams are used in the presentations so that the information presented is easy to understand and process.This subject includes information and hands-on activities that support students in their learning endeavors and in developing optimal collaborative and communicative relationships in a climate conducive to discovery learning. Practicing active listening and assertive communication skills and mechanisms to build feedback are considered as ways to regulate behavior in different situations and to adapt the pedagogical approach to students' learning needs. The ability to work in a team is practiced to solve different learning tasks.

10. Contents

COURSE		
Chapter	**Content**	**No. hours**
1	General properties of passive electronic components. General facts. Definitions. Classification. Characteristic quantities. Determining the parameter tolerances of electronic circuits as function of passive components tolerances. Determining the temperature variation coefficient of electronic circuits as function of passive components temperature variation coefficients. Determining the global tolerance of circuit parameters as function of passive components deviation. Thermal loading of passive components.	6
2	Resistors. Fixed resistors. Definition. Classification. Resistor characteristics. Internal noise of resistors. Maximum electric loading of resistors. Determining the maximum admissible values of electric quantities. Equivalent schematics. Resistor impedance as function of frequency. Description of the main types of resistors (braided, carbon film, thick and thin film, metal oxide, metallic foil). Resistive nets. Choosing the resistor type and determining its parameters as function of the used electronic circuit. Variable resistors (potentiometers). Definition. Classification. Potentiometer characteristics. Applications. Digital potentiometers (electronic). Nonlinear resistors. NTC and PTC thermistors, characteristics and applications. Varistors, principles, construction, applications. Surge arresters, principles, applications.	10
3	Capacitors. Definition, classification. Capacitor parameters. Capacitor marking. Description of the main types of capacitors (ceramic, with paper, with polyester, with polystyrene, with polycarbonate, with polypropylene). Electrolytic capacitors. Variable capacitors. Equivalent schematics. Capacitor impedance as function of frequency. Maximum electric load of capacitors, in continuous and impulse regime. Choosing the type and determining the parameters of the capacitor to be used in an electronic circuit, as function of its parameters. Supercapacitors, principles, construction, parameters. Problems in charging phase, balancing circuits. Applications.	6
4	Inductors. Definition, classification. Parameters. Constructive structure. Type of inductors, applications. Equivalent circuits. Inductor impedance as function of frequency. Maximum electric load of inductors.	4
5	Dedicated electronic components and circuits. Resistor as electric current sensor. Decoupling capacitors. Capacitors and inductors for net filtering. Shock inductors, ferrite pearls. Power capacitors. Decade dividers. Attenuators. RC filters. Planar transformers.	2
	Total:	28

Bibliography:

1. Ionescu Ciprian, Componente şi circuite pasive, https://curs.upb.ro/2023/course/view.php?id=10041.
2. P. Svasta, V. Golumbeanu, C. Ionescu, A. Vasile, Rezistoare, Editura Cavallioti, 2007.
3. P. Svasta, V. Golumbeanu, s.a, Componente electronice pasive - probleme, editura Cavallioti, 2009.
4. P. Svasta, V. Golumbeanu, Componente electronice pasive – Condensatoare, UPB, editura Cavallioti 2010.

LABORATORY		
Crt. no.	**Content**	**No. hours**
1	Fixed Linear resistors.	3

2	Capacitors.	3
3	Nonlinear resistors – thermistors, varistors.	3
4	Inductors.	3
5	Introduction in simulation of resistive circuits - PSPICE.	3
6	Simulation of resistive and capacitive structures.	3
7	Final lab. examination (colloquy)	3
	Total:	21

Bibliography:
1. Ionescu Ciprian, Componente şi circuite pasive, https://curs.upb.ro/2023/course/view.php?id=10041.

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 theoretical notions related to the parameters of the passive components. Comparative analysis/differential choice of components specific to a certain application.	Oral.	40%
	knowing how to apply the theory to solving problems.	Written.	10%
11.5 Seminary/laboratory/project	Home work.	Written report.	20%
	Lab. data processing.	Written report.	15%
	Final lab. test.	Oral.	15%
11.6 Passing conditions			
Achieve 50% from the total number of 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)

Through the passive component selection activities based on parameters in the catalog sheets, consideration is given to developing the graduate's ability to handle practical situations they may face in real life as an engineer in order to increase their contribution to improving the technical and economic performance of the electronics industry.

Date	Course lecturer	Instructor(s) for practical activities
25.09.2025	S.l./Lect. Dr. Cristina Ioana Marghescu	S.l./Lect. Dr. Cristina Ioana Marghescu

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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