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	
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)				Bazele electrotehnicii 1 Fundamentals of Electrical Engineering 1			
2.2 Course Lecturer				Conf. Dr. Ing. Iosif Vasile NEMOIANU			
2.3 Instructor for practical activities				S.l. Dr. Ing. Radu Mircea CIUCEANU			
2.4 Year of studies	1	2.5 Semester	I	2.6. Evaluation type	E	2.7 Course regime	Ob
2.8 Course type		D	2.9 Course code	04.D.01.O.005		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	3.00	3.3 seminary/laboratory	2
3.4 Total hours in the curricula	70.00	Out of which: 3.5 course	42	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.					28
Tutoring					0
Examinations					6
Other activities (if any):					0

3.7 Total hours of individual study	55.00
3.8 Total hours per semester	125
3.9 Number of ECTS credit points	5

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	**It is not the case**
4.2 Results of learning	It is not the case

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

5.1 Course	Board and projector
5.2 Seminary/ Laboratory/Project	Board and projector

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 introduction and presentation of the basic knowledge of electric circuit theory with concentrated parameters, through the lens of applications of interest in electronics, telecommunications, and information technology. Developing students' ability to solve problems of direct current electric circuits, single-phase and three-phase alternating current, in non-sinusoidal and transient steady states, understanding the field assumptions of electric circuit theory, and the phenomena of electric and magnetic fields in capacitors, inductors, transformers, and magnetic circuits.

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	Students' skills are developed to apply basic knowledge of electrical circuits to understanding, modeling, and analyzing linear and nonlinear circuit problems, identifying and comparing their operating regimes, and understanding the limitations of circuit models.
Transversal (General) Competences	The ability to find the optimal method for solving problems.

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.* • Describe, identify, summarize elementary concepts and methods related to modeling, analysis, design, and testing of computing systems, with microcontrollers or processors, operating systems, graphics processing systems, and data acquisition systems. • The regimes of electrical circuits. • The methodologies and tools used for analyzing electrical circuits. • Powers transferred in stationary and permanent harmonic conditions. • The powers transferred in the case of three-phase circuits. • Elements of specific electrical engineering such as functionality, scalability, and costs related to design and how they are applied to achieve electrical engineering projects. • Understand project management and the activities involved in this field. • Know the variables involved in project management, such as time, resources, requirements, deadlines, and respond to unforeseen events.
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).* • Utilizes specific methods for measuring electrical quantities and identifies digital and analog electronic devices. • Utilizes specific methods and tools for the analysis, design, and implementation of data acquisition, graphical processing, processing, and display systems. • Performs analysis of electrical circuits based on systematic problem-solving methods. • Applies schemes and design models for electrical circuits. • Utilizes reusable solutions, compiles best practices to meet common ICT development activities in software development and design. • Manages resources, budget, deadlines, and human resources related to electrical engineering projects and plans schedules and any technical activities relevant to the project. • Uses circuit elements necessary for synthesizing basic electronic circuits.

Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* • Shows initiative and action for updating professional, economic, and organizational culture knowledge. • Demonstrates honorable, responsible, and ethical behavior in accordance with the law to ensure the profession's reputation. • Manages processes and activities conducted in industrial organizations with the help of intelligent IT applications. • Responsibly applies the principles, norms, and values of professional ethics in carrying out professional tasks and identifying achievable objectives, available resources, work stages, execution durations, related deadlines, and associated risks. • Identifies opportunities for continuous training and effectively utilizes informational sources and communication and assisted professional training resources (Internet portals, specialized software applications, etc.) for personal development. • The ability to communicate with higher hierarchical structures and with the team under one's supervision.

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.)*

The following teaching methods will be used: both expository (lecture, presentation using PPT or video materials) and conversational-interactive, based on discovery learning models facilitated by direct and indirect exploration of reality (experiment, demonstration, modeling), as well as action-based methods, such as exercises and projects.

10. Contents

COURSE		
Chapter	**Content**	**No. hours**
1	• Introduction and overview. Electromagnetic field and circuits. Kirchhoff's theorems, field assumptions. - Kirchhoff's theorems, field assumptions. - Concentrated parameters, distributed parameters. - The limitations of circuit models.	3
2	• Circuit elements- The resistor. Equivalent resistances - Voltage and current dividers - Voltage sources, current, time variation - Dependent sources - Transformation of sources	10

3	• Resistive circuits - Kirchhoff's theorems. Equations of linear circuits. - Conservation of powers. - Thevenin, Norton equivalent circuits. - Node potential method. - Mesh current method. - Superposition theorem. - Reciprocity theorem. - Circuits with dependent sources.	5
4	• Nonlinear circuits in direct current - Elements of nonlinear circuit - Solving nonlinear circuits	3
5	• Capacitors - Capacitors, capacitive, capacitances - Circuits with capacitors and resistors in steady state	2
6	• Inductors - Coils, inductors, inductivities. - Inductive coupled circuits. - Circuits with coils and resistors in steady state.	2
7	• Sinusoidal alternating current circuits - Phasors. - Kirchhoff's theorems in complex. - Equivalent impedances. - Resonant circuits. - Analysis of AC circuits. - Powers in alternating current.	6
8	• Three-phase electrical networks - Balanced three-phase networks. - Unbalanced three-phase networks .- Powers in three-phase networks. Measuring three-phase powers.	4
9	• Linear electrical circuits in non-sinusoidal periodic regime - Circuit elements in non-sinusoidal regime. - Circuits with sources having multiple harmonic components	3
10	• Linear electric circuits in transient regime - Circuits with a single capacitive/inductive element. - The Laplace transform method.	3
	Total:	42

Bibliography:

- Nemoianu, Iosif Vasile, “Bazele Electrotehnicii 1”, suport de curs electronic, https://archive.curs.upb.ro/2024/course/view.php?id=5987.
- Alexander Sadiku, Analyse des circuits électriques, De Boek 2012 .
- A. Moraru, Bazele electrotehnicii, Teoria circuitelor electrice .
- T.R. Kuphaldt, Lessons in Electric Circuits A free series of textbooks on the subjects of electricity and electronics, Volume I – DC, Volume II – AC .
- Comitetul Electrotehnic Internaţional – CEI, Electropedia: The World's Online Electrotechnical Vocabulary IEC 60050 CEI, The International System of Units and the IEC.
- J.A. Svoboda, Electric Circuit Study Applets.
- J.A. Svoboda, Interactive Examples & Exercises M.D. Filipovic, Understanding Electronics Components Amanogawa & Semchip, Circuit Applets (Power components for sinusoidal signal. Parallel and series resonant circuits).
- The Nuffield Foundation, Electric Circuits & Fields.
- Al. Timotin, V. Hortopan, M. Preda, Fl. Manea, Lecţii de Bazele Electrotehnicii, Editura Didactică şi Pedagogică, Bucureşti, 1979.
- L. Ochiană, I.F. Hănţilă, I. Nemoianu, A. Anghel, Bazele electrotehnicii; Culegere de probleme; Partea I Curent continuu, Editura Printech, Bucureşti, 2007; Partea II – Curent alternativ, Editura Politehnica Press, Bucureşti, 2008.
- Al Nicolae, Regimul nesinusoidal al circuitelor electrice liniare şi neliniare. Teorie şi probleme, Editura Matrix Rom, Bucureşti, 2007.
- Anca Tomescu, I.B.L. Tomescu, F.M.G. Tomescu, Electrotehnică, Câmp electro-magnetic, Circuite electrice, Editura Matrix Rom 2007.
- C. Flueraşu, Corina Flueraşu, Circuite electrice: teorie, modelare, simulare, Editura Printech, Bucureşti, 2008.
- G. Ionescu, Veronica Păltânea, Gh. Păltânea, Circuite electrice – Aplicaţii, Editura Printech, Bucureşti, 2008.
- M. Preda, P. Cristea, F. Spinei, Bazele Electrotehnicii, 2 volume, Editura Didactică şi Pedagogică, Bucureşti, 1978, 1983.
- I.F. Hănţilă, M. Vasiliu, Câmpul electromagnetic variabil în timp, Electra-2005 M. Vasiliu, I.F. Hănţilă, Electromagnetics, Editura Electra, Bucureşti, 2006.

SEMINARY

Crt. no.	Content	No. hours
1	Resistors in series, in parallel. Division of voltages, currents. Voltage diagrams, currents. Transformation of sources.	4
2	The method of Kirchhoff's theorems for direct current circuits.	4
3	The node potential method, the loop current method.	4
4	Methods of analysis of electrical circuits in complex.	4
5	Three-phase networks.	4
6	Circuits in non-sinusoidal periodic regime.	4
7	Transitional regimes in linear circuits (in the time domain).	4
	Total:	28

Bibliography:

- Nemoianu, Iosif Vasile, “Bazele Electrotehnicii 1”, suport de curs electronic, https://archive.curs.upb.ro/2024/course/view.php?id=5987.
- J.A. Svoboda, Electric Circuit Study Applets .
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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	verification work during the semester	The written presentation of theoretical subjects and their applications	40
	final examination	The written presentation of theoretical subjects and their applications	40
11.5 Seminary/laboratory/project	the assessment of the activity at the seminar and the topics for individual study	written	20
11.6 Passing conditions			
Achieving at least 50% of the total score			

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)

Identifying roles and responsibilities within a multidisciplinary team and applying relationship techniques and effective work within the team.

Respecting different cultures, customs, and professional technical methods and procedures inherent to an industry with many differences based on locality, region, country, or continent.

Date	Course lecturer	Instructor(s) for practical activities

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25.09.2025	Conf. Dr. Ing. Iosif Vasile NEMOIANU	S.l. Dr. Ing. Radu Mircea CIUCEANU
		S.l. Dr. Ing. Lavinia Maria BOBARU
Date of department approval	Head of department	
Date of approval in the Faculty Council	Dean	