Syllabus

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Automation and Computer Science
1.3 Departament	Automation
1.4 Field of study	Automation. Applied Informatics and Intelligent Systems
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Automation and Applied Informatics (English)
1.7 Form of education	Full time

2. Data about the subject

2.1 Subject name	***Electrotechnics***			Discipline code	10.00
2.2 Course responsible/lecturer	Lect.Dr.Eng. Claudia Constantinescu - Claudia.Constantinescu@ethm.utcluj.ro				
2.3 Teachers in charge of applications	S.l. dr. ing. Marian Razvan Gliga – Marian.Gliga@ethm.utcluj.ro S.l. dr.ing. Sergiu Andreica– Sergiu.Andreica@ethm.utcluj.ro Asist. drd. ing. Lavinia Opriș - Lavinia.Opris@ethm.utcluj.ro				
2.4 Year of study	1	2.5 Semester	2	2.6 Assessment *(E/C/V)*	E
2.7 Type of subject	*DF – fundamental, DS – specialty, DC – complementary*				DF
	DOB – compulsory, DOP – elective, DFA – optional				DOB

3. Estimated total time

3.1 Number of hours per week	4	of which:	3.2. Course	2	3.3 Seminar		3.3 Laboratory	2	3.3 Project	
3.4 Number of hours per semester	56	of which:	3.5 course	28	3.6 Seminar		3.6 Laboratory	28	3.6. Project	

3.7 Individual study	
(a) Manual, lecture material and notes, bibliography	12
(b) Supplementary study in the library, online and in the field	10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	15
(d) Tutoring	2
(e) Exams and tests	5
(f) Other activities:	0

3.8 Total hours of individual study (sum of (3.7(a)...3.7(f)))	44
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	Mathematical Analysis, Linear Algebra
4.2 Competence	Solving diferential and integral equations, vectorial calculation

5. Requirements (where appropriate)

5.1. For the course	Attendance is not required
5.2. For the applications	The laboratory classes can be recovered according with the ECTS rules. All the presences are required to be allowed at the laboratory colloquium (test) and then at the exam

6. Specific competences

Professional Competences	C1. Use of knowledge in mathematics, physics, measurement techniques, engineering graphics, mechanical, chemical, electrical, and electronic engineering in systems engineering. C1.1 Use of the concepts, theories, and methods of the fundamental sciences employed in systems engineering for professional communication. C1.2 Explanation of engineering problems and justification of solutions in systems engineering through the application of techniques, concepts, and principles from mathematics, physics, engineering graphics, electrical engineering, and electronics.

Cross Competences	Work effectively both independently and as a member of a multidisciplinary engineering team. Communicate technical information, experimental results, and engineering solutions clearly in oral and written English. Demonstrate professional responsibility, ethical behavior, and compliance with laboratory safety regulations. Develop autonomous learning skills and continuously update professional knowledge in electrical engineering and related fields.

7. Expected learning outcomes

Knowledge	The student/graduate describes, identifies, and summarizes concepts and methods related to systems in general, as well as to measurement technology, engineering graphics, mechanical, chemical, electrical, and electronic engineering, and their application to specific engineering problems, using appropriate mathematical and physical tools.
Skills	The student/graduate explains engineering problems, justifies solutions in systems engineering based on mathematical principles and the laws of physics, and uses fundamental components of the field together with techniques for measuring electrical and non-electrical quantities. The student/graduate applies appropriate physical principles, mathematical methods, and numerical computation techniques to solve common problems in systems engineering, with particular emphasis on numerical methods. The student/graduate selects and applies appropriate scientific methods and techniques for the development and implementation of systems engineering projects and evaluates the level of scientific documentation and the potential for applying research results in engineering practice.
Responsibilities and autonomy	The student/graduate carries out systems engineering project management activities, assuming different roles within a team, and communicates results clearly and concisely, both orally and in writing

8. Course objectives

General objective	Knowledge of the fundamental principles of electrical engineering: electromagnetic field theory and electric circuit theory.
Specific objectives	- Acquisition of theoretical knowledge in the field of electrical engineering. - Knowledge and application of methods for calculating the parameters of electrical circuits. - Knowledge and application of methods for analyzing linear electrical circuits under sinusoidal steady-state and transient operating conditions, as well as quadripole circuits. - Acquisition of practical skills in the analysis and implementation of electrical circuits.

9. Contents

9.1 Lecture	No.hours	Teaching methods	Notes
1. Introduction to Electromagnetic Field Theory. Specific laws of the Electrostatic Field. Electrical Capacitance and Calculation Methods. Energy and Forces in Electrostatic Fields. Applications.	2	The course will be delivered both through traditional classroom teaching (blackboard lectures) and by using multimedia resources, including video projection and electronic PowerPoint (PPT) presentations.	
2. Specific Laws of the Electrokinetic Field. Electrical Resistance and Calculation Methods. Resistor Connections. Applications.	2		
3. Specific Laws of the Magnetic Field. Inductances and Calculation Methods. Energy and Forces in Magnetic Fields. Applications.	2		
4. Magnetic Circuit Law. Electromagnetic Induction Law. Applications.	2		
5. Introduction to Linear Electric Circuit Theory. Circuit Topology. Direct Current (DC) Electric Circuits. Energy Sources. Passive Circuit Elements. Delta–Star and Star–Delta Transformations. Applications.	2		
6. Fundamental Laws and Theorems. Methods for Solving Direct Current (DC) Electric Circuits (I). Power Conservation. Maximum Power Transfer. Applications.	2		
7. Methods for Solving Direct Current (DC) Electric Circuits (II): Loop Current Method; Node Potential Method. Applications.	2		

8. Theorems for Solving Direct Current (DC) Electric Circuits. Vaschy's Theorems. Reciprocity Theorems. Equivalent Generator Theorems. Applications.	2		
9.Linear Electric Circuits under Permanent Sinusoidal Regime. Sinusoidal Quantities. Symbolic Representation of Sinusoidal Quantities. Circuit Elements in Alternating Current (AC). Applications.	2		
10. Power in Sinusoidal Regime. Complex Representation of Linear Electric Circuits. Laws and Theorems in Complex Form. Equivalent Complex Impedances. Applications.	2		
11. Theorems and Methods for the Analysis of Linear Alternating Current (AC) Electric Circuits. Superposition Theorem. Maximum Power Transfer Theorem. Vaschy's Theorems. Kirchhoff's Laws. Applications.	2		
12.Theorems and Methods for the Analysis of Linear Electric Circuits (II). Loop Current Method. Node Potential Method. Power Conservation Theorem. Power Balance. Applications.	2		
13. Resonance in Electric Circuits. Quadripoles. Equations and Parameters. Equivalent Circuits. Symmetrical Quadripoles.	2		
14. Transient Analysis of Linear Electric Circuits. Direct Method. Operational Method. Applications.	2		

Bibliography

1. C. Constantinescu, Electrotechnics Courses, ppt, 2020, https://users.utcluj.ro/~claudiah/
2. M. Iordache, Bazele electrotehnicii, Editura MATRIX ROM, București, 2008.
3. R. Ciupa, V. Ciupa, The Theory of Electric Circuits, Casa Cărţii de Ştiinţă, Cluj-Napoca, Romania, ISBN 973-9204-98-8, 1998.
4. Anca Tomescu, I.B.L. Tomescu, F.M.G. Tomescu, Electrotehnică. Câmp electromagnetic. Circuite electrice, Editura MATRIX ROM, București, 2007.
5. R. Ciupa, V. Ţopa, Teoria circuitelor electrice, Casa Cărţii de Ştiinţă, Cluj-Napoca, Romania, ISBN 973-9204-98-8, 2004.

9.2 Applications (seminar/laboratory/project/practical work)	No.hours	Teaching methods	Notes
1. Occupational Health and Safety Regulations. Introduction to the Laboratory and Available Equipment.	2	Didactic demonstration and experimentation, practical exercises, teamwork.	Practical implementation of laboratory work by students, acquisition of experimental data, data processing and interpretation of results.
2.Determining the Spectrum and Equipotential Surfaces of an Electric Field with an Electrokinetic Model.	2		
3.Electrical Model for Laplace's Finite Difference Equation Applied to the Determination of Equipotential Surfaces and the Spectrum of an Electrostatic Field.	2		
4. Study of a Magnetic Circuit	2		
5.Verification of the Electromagnetic Induction Law	2		
6. Study of Equivalent Resistance in Linear Direct Current Electric Circuits	2		
7. Study of Direct Current Electric Circuit	2		
8.Study of the Power Conservation Theorem in Linear Direct Current Electric Circuits	2		
9. Study of the Passive Dipole in Alternating Current Circuits	2		
10.Study of the Power Conservation Theorem in Linear Alternating Current Electric Circuits	2		
11.The Study of Series R, L, C Circuit and Voltage Resonance Phenomena.	2		
12.The Study of Parallel R, L, C Circuit and Current Resonance Phenomena.	2		
13.The Study of a Passive Quadripole (Two Ports Network).	2		
14. Laboratory Colloquium	2		
Bibliography			

1. Păcurar Claudia, Giurgiuman Nicoleta-Adina, Creţu Mihaela, Marian-Răzvan Gliga, Andreica Sergiu-Iulian, Bazele electrotehnicii, Îndrumător de laborator, Editura U.T.Press, Cluj-Napoca, România, ISBN 978-606-737-492-6, 156 pagini, 2020.
2. Adina N. Răcăşan, C. Munteanu, V. Ţopa, Claudia Păcurar, Claudia Constantinescu, Modelarea numerică a câmpului electromagnetic. Indrumator de laborator – Volumul 1, Editura UTPRESS, Cluj-Napoca, România, ISBN 978-606-737-195-6, 228 pagini, 2016.
3. E. Simion, T.D. Gligor, Gh. Mindru, R. Ciupa, V. Popescu, D. Micu, M. Topa, V. Topa, Bazele electrotehnicii – indrumator de laborator, Atelierul de multiplicare al Institutului Politehnic Cluj-Napoca, 1987.

10. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The course content and the acquired knowledge, skills, and competences are aligned with the expectations of professional organizations, employers, and the Romanian Agency for Quality Assurance in Higher Education (ARACIS)

11. Evaluation

Activity type	11.1 Assessment criteria	1.2 Assessment methods	11.3 Weight in the final grade
11.4 Course	Assessment of the acquired theoretical knowledge	Examination: a 3-hour written examination consisting of both theoretical questions and problem-solving exercises.	90%
11.5seminar/laboratory/ project/ practical work	Assessment of the acquired practical skills.	Laboratory test based on the completed laboratory experiments.	10%
11.6 Minimum performance standard Minimum passing grade: 5, calculated based on the course and laboratory assessments.			

Date of filling in:		Title Firstname NAME	Signature
10.07.2026	Course	Lect.Dr.Eng. Claudia Constantinescu	
	Aplications	Ș.l. dr. ing. Sergiu ANDREICA	
		Ș.l. dr. ing. Marian Răzvan GLIGA	
		Asist. drd. ing. Lavinia OPRIȘ	

Date of approval by the Department Board	Head of Departament Prof.dr.ing. Honoriu VĂLEAN
Date of approval by the Faculty Council	Dean Prof.dr.ing. Vlad MUREȘAN