SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Computer science / Engineer
1.7 Form of education	Full time

2. Data about the subject

2.1 Subject name	***Electrotechnics***			Subject code	**10**
2.2 Course responsible / lecturer	Prof. dr. eng. Darabant Laura - Laura.Darabant@et.utcluj.ro				
2.3 Teachers in charge of seminars / Laboratory / project	Prof. dr. eng. Darabant Laura - Laura.Darabant@et.utcluj.ro Lecturer dr. eng. Alexandru Mureșan - Alexandru.Muresan@ethm.utcluj.ro				
2.4 Year of study	I	2.5 Semester	1	2.6 Type of assessment (E - exam, C - colloquium, V – verification)	E
2.7 Subject category	Formative category: DF – fundamental, DS – speciality, DC – complementary				DF
	Optionality: DOB – mandatory, DOP – optional (alternative), DFA – optional (free choice)				DOB

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	3	Seminars	-	Laboratory	1	Project	-
3.2 Number of hours per semester	56	of which:	Course	42	Seminars	-	Laboratory	14	Project	-
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										23
(b) Supplementary study in the library, online and in the field										12
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										20
(d) Tutoring										10
(e) Exams and tests										4
(f) Other activities:										-

3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	69
3.5 Total hours per semester (3.2+3.4)	125
3.6 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	Mathematics I, II; Physics
4.2 Competence	N/A

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	Attending the labs is mandatory

6. Specific competence

6.1 Professional competences	**C1 –** Operating with basic Mathematical, Engineering and Computer Science concepts • **C1.1 –** Recognizing and describing concepts that are specific to the fields of calculability, complexity, programming paradigms, and modeling computational and communication systems
	• **C1.2 –** Using specific theories and tools (algorithms, schemes, models, protocols, etc.) for explaining the structure and the functioning of hardware, software and communication systems • **C1.3 –** Building models for various components of computing systems • **C1.4 –** Formal evaluation of the functional and non-functional characteristics of computing systems • **C1.5 –** Providing a theoretical background for the characteristics of the designed systems
6.2 Cross competences	N/A

7. Expected Learning Outcomes

Knowledge	Describes, identifies, summarizes elementary concepts and methods related to systems in general and digital systems in particular and their application in concrete problems, namely: • The concepts and laws of the electromagnetic field. Methods of calculating resistances, capacities and inductivities. • The concepts and theorems of the theory of DC and AC electric circuits: complex representation of sinusoidal quantities, specific methods of solving electric circuits, equivalent impedances. • Concepts regarding passive electrical two-port networks and filters. • Special operation regimes of electric circuits: non-sinusoidal and transient.
Skills	Uses specific methods of measuring electrical quantities and identifies digital and analog electrical devices. Uses specific theories and tools (laws and theorems, equivalent models, matrix methods, etc.) for the analysis, simulation and design of electric circuits.
Responsibilities and autonomy	Runs computer and information technology project management processes, assuming various roles in the team and clearly and concisely describing the results verbally and in writing.

8. Discipline objective (as results from the *key competences gained*)

8.1 General objective	Operating with basic concepts of electrical engineering
8.2 Specific objectives	1. Acquiring theoretical knowledge regarding electrotechnics. 2. Acquiring practical skills regarding electrical circuits.

9. Contents

9.1 Lectures	Hours	Teaching methods	Notes
Electric and magnetic quantities. Static electric and magnetic fields (the electric field in free space and in material, electric current, the magnetic field in free space and in material)	3	Multimedia, PowerPoint Presentations, Demonstration board.	
Laws and theorems of electromagnetic field	3		
Electrical capacitance, energy and forces	3		
Magnetic circuits. Self-inductance and mutual inductance. Magnetic energy and forces.	3		
Basic concepts, units and laws of circuit theory (characteristic values, power in sinusoidal regime, representation of sinusoidal functions by vectors and complex numbers)	3		
The characterization of the linear circuits in the complex plane, the	3		

complex form of some theorems			
Equivalent impedances (series and parallel connection, without mutual inductance, with mutual inductance, real condenser, real inductance, air core transformer)	3		
Resonance (in series, parallel, real, inductively coupled circuits, power factor improvement)	3		
Network theorems (the superposition theorem, Thevenin-Norton theorem)	3		
Network theorems (mesh or loop analysis, node analysis, matrix methods)	3		
Two-port networks (equations, equivalent circuits, open-circuit and short-circuit tests, characteristic impedance, propagation constant, filters)	3		
Study-state periodic non-sinusoidal regime (Fourier expansion, power, network analysis)	3		
Transient regime of linear circuits (continuity conditions, transient behavior of the R-L, R-C and R, L, C)	3		
Transient regime of linear circuits (the Laplace transform, Duhamel integral, state variable method)	3		

Bibliography:

1. The Theory of Electric Circuits, authors: RV Ciupa, V. Ţopa, Casa Cartii de Stiinta Publishing House, 2003, ISBN 973-9204-98-8
2. Simion, E., Maghiar, T., *Electrotehnica*, E.D.P., Bucureşti, 1982
3. Mocanu, C. I., *Teoria câmpului electromagnetic,* E.D.P., Bucureşti, 1981

9.2 Applications - Seminars / Laboratory / Project	Hours	Teaching methods	Notes
Determination of the spectrum and equipotential surfaces of an electric field using an electrokinetic model	1	Practical exercises.	
Electrical model for Laplace equation in finite differences applied at equipotential surfaces and electrostatic field spectrum determinations	1		
Computing capacitances, resistances and inductances for given structures	1		
Analysis of the R, L, C series circuit and voltage resonance	1		
Analysis of the R, L, C parallel circuit and current resonance	1		
Study of a passive two-port network	1		
Representation of sinusoidal functions by vectors and complex numbers	1		

Bibliography:

1. Răduleţ, R., *Bazele electrotehnicii. Probleme.*, E.D.P., Bucureşti, 1981
2. Dan Doru Micu, **Laura Darabant**, Denisa Stet, Mihaela Cretu, Andrei Ceclan, Levente Czumbil, Teoria circuitelor electrice. Probleme, UT Press, Cluj-Napoca, 978-606-737-140-6, 2016, 280 pagini;

**Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.*

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

Conținutul cursului este în acord cu cerințele formulate de firme de profil.

11. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	- degree of knowledge of basic concepts - the ability to analyze electrical circuits	Two hours written examination, written test (WT)	0.8 WT
Seminar	-		
Laboratory	The ability to measure or compute electric quantities	Laboratory works (LW)	0.2 LW

Project	-		
Minimum standard of performance: N=0,8 WT + 0,2 LW Pass conditions: N≥50%; LW≥50%			

Date of filling in: 21.04.2026	**Responsible**	**Title, First name Last name**	**Signature**
	Course	Prof.dr.eng. Laura DARABANT	
	Applications	Prof.dr.eng. Laura DARABANT	
		Lecturer dr. eng. Alexandru MURESAN	

Date of approval in the department	Head of department , Prof.dr.eng. Rodica Potolea
Date of approval in the Faculty Council	Dean, Prof.dr.eng. Vlad Mureșan