SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Electrotechnics and Measurements
1.4	Field of study	Electrical Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/ Qualification	Electrical System Cluj-Napoca in English language
1.7	Form of education	Full time
1.8	Subject code	35.00

2. Data about the subject

2.1	Subject name				Electric devices	
2.2	Course responsible/ lecturer				Assoc. Prof. Eng. Aurel Botezan, PhD	
2.3	Teachers in charge of Seminars/ Laboratory/ Project				Assoc. Prof. Eng. Aurel Botezan, PhD	
2.4 Year of study		III	2.5 Semester	1	2.6 Type of assessment *(E – exam, C – colloquium, V – verification)*	E
2.7 Subject category		*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DD
		DI – compulsory, DO – elective, Dfac – optional				DI

3. Estimated total time

3.1 Number of hours per week:	4	of which	3.2 Course	2	3.3 Seminar	0	3.3 Laboratory	2	3.3 Project	
3.2 Total hours per semester	56	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laboratory	28	3.6 Project	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	21
(b) Supplementary study in the library, online and in the field	14
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	10
(e) Exams and tests	4
(f) Other activities	6
3.8 Total hours of individual study *[sum (3.7(a) to 3.7(f))]*	69
3.9 Total hours per semester *[sum of 3.4 and 3.8]*	125
3.10 Number of credit points	5

4. Prerequisites (where applicable)

4.1	Curriculum	Fundamentals of Electrical Engineering
4.2	Competences	

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	Mandatory presence

6. Specific competences

Professional competences	To understand the heating phenomena of electrical equipment; To understand phenomena related to electrodynamic and electromagnetic forces; To understand phenomena related to the electric arc and switching in electrical circuits; To understand phenomena related to protection and switching devices.
Cross competences	To use and operate electrical measuring instruments

7. Expected learning outcomes

Knowledge	The student/graduate analyzes well-defined electrical engineering problems; identifies relevant standards and regulations, and uses appropriate engineering resources and tools.
Abilities	The student/graduate produces sketches and designs electrical systems, products, and components using computer-aided design (CAD) software and equipment. The student/graduate creates drawings of electrical panels, electrical schematics, wiring diagrams, and other assembly details. The student/graduate develops technical sketches and drawings using specialized software. The student/graduate selects and applies current methods of modeling, calculation, design, and testing specific to their field of specialization.
Responsibility and autonomy	The student/graduate applies project management methods and economic approaches, such as risk and change management, while understanding their limitations. The student/graduate reflects critically and responsibly, in a democratic spirit, on the ethical and social responsibilities associated with managing activities in electrical engineering, decision-making, and forming professional opinions.

8. Discipline objectives (based on specific competencies acquired)

8.1	General objective	To design, use, and operate electrical switching and protection devices.
8.2	Specific objectives	Use of electrical measuring instruments

9. Contents

9.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	C1 General considerations regarding electrical equipment	2	Presentation	
2	C2 Thermal processes and stresses in electrical equipment	2		
3	C2 Thermal processes and stresses in electrical equipment (continued)	2		
4	C4 Electrodynamic forces	2		

5	C5 DC electromagnets	2		
6	C6 AC electromagnets	2		
7	C7 Electric arc	2		
8	C8 Electric arc (continued)	2		
9	C9 Fuses	2		
10	C10 Low-voltage circuit breakers	2		
11	C11 Medium- and high-voltage circuit breakers	2		
12	C12 Electrical contacts	2		
13	C13 Reactors (inductors)	2		
14	C13 Reactors (inductors)	2		

Bibliography

1.Horia Bălan, Aurel Botezan, Radu A. Munteanu, Echipamente electrice, EdituraMEDIAMIRA, Cluj Napoca 2010, ISBN 978-973-713-282-6.
2.Darie S., Feștilă L., Lazea G., Aparate electrice. Îndrumător de laborator, Lito IPCN 1979,Cluj Napoca.
3.Bălan H., Tîrnovan R., Proiectarea și încercarea echipamentelor electrice. UTPRESS 1998Cluj Napoca.
4.Hortopan G., Aparate electrice, EDP, București 1980.

9.2. Applications - Seminar /Laboratory/Project		Number of hours	Teaching methods	Additional remarks
1	Health and Safety Procedures	2	Experiment	
2	Laboratory Introduction	2		
3	Heating of Electrical Equipment under Steady-State Conditions	2		
4	Heating of Electrical Equipment under Intermittent Operation	2		
5	Electrodynamic Forces	2		
6	Study of Actuating Electromagnets	2		
7	Low-Voltage Circuit Breakers and Contactors	2		
8	Study of Medium- and High-Voltage Circuit Breakers	2		
9	Current Relays and Voltage Relays	2		
10	Intermediate and Time Relays	2		
11	Instrument Transformers	2		
12	Protection of Electrical Installations in Residential Environments	2		
13	Make-up Laboratory Sessions for Missed Work	2		
14	Finalization of Laboratory Assessment	2		

Bibliography

1.Horia Bălan, Aurel Botezan, Radu A. Munteanu, Echipamente electrice, EdituraMEDIAMIRA, Cluj Napoca 2010, ISBN 978-973-713-282-6.
2.Darie S., Feștilă L., Lazea G., Aparate electrice. Îndrumător de laborator, Lito IPCN 1979,Cluj Napoca.
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4.Hortopan G., Aparate electrice, EDP, București 1980.

10. Alignment of course content with expectations of the epistemic community, professional associations, and representative employers in the field

11. Assessment

Activity type	11.1 Assessment criteria	11.2 Assessment methods	11.3 Weight in the final grade (%)
11.4 Course	Knowledge	Exam	0.7
11.5 Laboratory	Practical Skills and Abilities	Continuous assessment	0.3
11.5 Project			
11.6 Minimum standard of performance: N>5			

Date of completion	Lecturers	Title/ Surname/ Name:	Signature
January 2026	Course	Assoc. Prof. Eng. Aurel Botezan, PhD	
	Applications Seminar/ Laboratory/ Project	Assoc. Prof. Eng. Aurel Botezan, PhD	

Date of approval in the ETHM Department Council January 2026	**Head of Department:** Prof. Eng. MICU Dan Doru, PhD
Date of approval in the Faculty of Electrical Engineering Council February 2026	**Dean:** Assoc. Prof. Eng. CZIKER Andrei, PhD