SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Electrical Machines and Drives
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	26.00

2. Data about the subject

2.1	Subject name			Electrical Machines			
2.2	Course responsible/lecturer			Prof. Claudia Martis, PhD			
2.3	Teachers in charge of Laboratory			Lect. Mircea Ruba, PhD			
2.4 Year of study	2	2.5 Semester	2	2.6 Assessment	E		
2.7 Subject category	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*						DD
2.7 Subject category	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*						DI

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 Total hours in the curriculum	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	12
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	12
(d) Tutoring	6
(e) Exams and tests	2
(f) Other activities	0

3.8 Total hours of individual study (summ (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	
4.2	Competence	Electromagnetism, Mechanics, Electrical circuits, Materials

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications Seminar /Laboratory/Project	

6. Specific competences

Professional competences	Principles of construction and operation of classical electric machines; Understanding the operating regimes of electric machines and their specifics; Elements of analysis of the permanent regimes of the classic electric machines; Mathematical support for the analysis and evaluation of the performances and specific characteristics of electric machines Identification of electric machines and their component parts; Calculation of the performances and permanent regime characteristics of the classic electric machines; Experimental evaluation of parameters and raising the specific characteristics of classic electric machines; Making experimental montages The use of the analog / digital measuring devices necessary to perform the measurements on the test stands of classic electric machines; Understanding an electrical scheme of the experimental setup; Making experimental montages; Acquisition / processing / interpretation of measured data
Cross competences	Integration in a team, distribution of tasks, time management.

7. Expected learning outcomes

Knowledge	The student/graduate identifies, formulates, analyzes the principles of electricity circuits and the risks associated with them.
Abilities	The student/graduate assembles electromechanical equipment and appliances according to their specifications.
Responsibility and autonomy	The student/graduate demonstrates autonomy in learning on specific engineering issues.

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

8.1	General objective	Familiarization of students with the types of classic electric cars, their construction and operation principles.
8.2	Specific objectives	Understanding the principles of construction and operation of classic electric machines, respectively their specific operating

		regimes, using mathematical support to describe the permanent regime and to evaluate performance. Identification of electrical machines and their use in test stands, with measurements to determine the parameters, raising the characteristics and evaluating their performance.

9. Contents

9.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Introductory notions (Why Electrical Engineering; The role and place of electric machines; How we approach electric machines)	2	In the classroom using media hardware or online using TEAMS platform	
Introductory notions (Operating regimes of electric machines; How to deal with problems associated with electric machines; Elements of field theory necessary in addressing and treating problems associated with electric machines)	2		
Introductory notions (Constructive elements of electric machines; Flows and inductances in electric machines; Losses in electric machines; Representation of sinusoidal quantities)	2		
Electric transformer (General considerations on transformer operation; Construction elements; Equations and equivalent schemes)	2		
Electric 3-phase transformer	2		
General aspects of AC machines (Magnetic fields and windings)	2		
Asynchronous machine (General, construction and operation)	2		
Asynchronous machine (Equivalent wiring diagram, Electromagnetic torque, Operating characteristics)	2		
Synchronous machine (General, construction and operation)	2		
Synchronous machine (Synchronous machine power and torque, features, applications)	2		
DC machine (General, construction and operation)	2		
DC machine (Operating modes and characteristics)	2		
Synthesis on the principles of construction and operation of classic electric machines	2		
Design and analysis of electrical machines (generalities)	2		
Bibliography J. Pyrhonen, T. Jokinen, V. Hrabocova, Design of rotating electrical machines, 2008 John Wiley & Sons, Ltd A.E. Fitzgerald, C. Kingsley Jr., S.D. Umans, Electric Machinery, McGraw-Hill Higher Education, 2003			
9.2. Seminar /Laboratory/Project	Number of hours	Teaching methods	Notes
Labor protection and laboratory presentation	4	In the classroom using media	
Introductory notions: electromagnetic phenomena	4		

Single phase transformer	4	hardware or online using TEAMS platform	
Induction machine	4		
Synchronous machine	4		
DC machine	4		
Laboratory activity evaluation	4		
Bibliography J. Pyrhonen, T. Jokinen, V. Hrabocova, Design of rotating electrical machines, 2008 John Wiley & Sons, Ltd A.E. Fitzgerald, C. Kingsley Jr., S.D. Umans, Electric Machinery, McGraw-Hill Higher Education, 2003			

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

11. Evaluation

Activity type	11.1 Assessment criteria	11.2 Assessment methods	11.3 Weight in the final grade
11.4 Course	Knowledge of the constructive and operating principles of classic electric machines; The energy balance for each electric machine, both in motor mode and in generator mode The characteristics of electric machine	Written test (maximum 6 points)	60%
11.5 Seminar/ Laboratory/Project	Knowledge of electromagnetic components and phenomena in classical electric machines Experimental test bench utilisation	Written test and measurements (4 points)	40%
11.6 Minimum standard of performance			
Minimum 2 points obtained in the laboratory test and minimum 3 points obtained from the written exam and individual study. Solving the laboratory test and completing the test from the written exam			

Date of filling in:		Title Surname Name	Signature
11.2025	Lecturer	Prof. Claudia Martis, PhD	
	Teachers in charge of application	Lect. Mircea Ruba, 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