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	58.10

2. Data about the subject

2.1	Subject name		Electrical Systems Maintenance			
2.2	Course responsible/ lecturer		Assoc. Prof. Dr. Eng. Claudiu Alexandru Oprea – Claudiu.Oprea@emd.utcluj.ro			
2.3	Teachers in charge of Seminars/ Laboratory/ Project		Assoc. Prof. Dr. Eng. Claudiu Alexandru Oprea – Claudiu.Oprea@emd.utcluj.ro			
2.4 Year of study	4	2.5 Semester	2	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*					DS
	DI – compulsory, DO – elective, Dfac – optional					DO

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	32
(b) Supplementary study in the library, online and in the field	27
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	4
(d) Tutoring	4
(e) Exams and tests	2
(f) Other activities	

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	-
4.2	Competences	-

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	Attendance to laboratory is mandatory

6. Specific competences

Professional competences	- Ability to plan, control and implement maintenance programs - Apply various fault detection techniques - Develop monitoring and diagnosis systems in industrial settings - Implement diagnostic techniques on electrical and electronic equipment - Use instruments to measure current, voltage, temperature, vibration, noise, and other parameters
Cross competences	Teamwork, task delegation, time management.

7. Discipline objectives (based on specific competencies acquired)

7.1	General objective	Knowledge of maintenance techniques in industrial systems.
7.2	Specific objectives	Understanding and applying maintenance techniques in electrical, energy, and electromechanical

8. Contents

8.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	Maintenance policies	2	Lecture, discussions, video material presentations, multiple-choice tests during the course	Teaching is conducted in a hybrid format, using the TEAMS and Forms platforms.
2	Predictive maintenance: thermography, tribology, ultrasonic noise	2		
3	Predictive maintenance using vibration diagnostics	2		
4	Equipment testing: insulation in DC	2		
5	Equipment testing: insulation in AC	2		
6	Grounding installations – testing and maintenance	2		
7	Cable testing	2		
8	Transformer monitoring and diagnostics	2		
9	Electrical machines and drive diagnostics	2		
10	Industry 4.0 & IIoT in maintenance	2		
11	Electromechanical system diagnostics (automotive)	2		
12	Industrial manufacturing systems diagnostics	2		
13	Wind-based power systems diagnostics	2		
14	Hydro-based power systems diagnostics	2		

Bibliography

[1] Marțiș C., Hedeșiu H., Jurca F., Oprea C., Ruba M., 'Introduction to Electromechanical Systems', Alma Mater, 2012

[2] Gill P., 'Electrical Power Equipment Testing and Maintenance', CRC Press, 2009

[3] McMillan R.B., 'Rotating Machinery', Marcel Dekker INC, 2004

[4] Adams M.L., 'Rotating Machinery Vibration', Marcel Dekker INC, 2000

8.2. Applications - Seminar /Laboratory/Project		Number of hours	Teaching methods	Additional remarks
1	Data acquisition & signal processing with LabVIEW. Vibration and noise diagnostics in electric machines	4	Theoretical presentation followed by the setup of experimental stands and measurement activities, using interactive testing methods.	Hybrid teaching system
2	Maintenance program development (standards, procedures)	4		
3	Shaft alignment using SKF systems	4		
4	Induction machine stator defect identification	4		
5	Thermography in fault detection	4		
6	Grounding installations	4		
7	IIoT & Industry 4.0 remote monitoring using LabVIEW	4		

Bibliography

[1] Marțiș C., Hedeșiu H., Jurca F., Oprea C., Ruba M., 'Introduction to Electromechanical Systems', Alma Mater, 2012

[2] Gill P., 'Electrical Power Equipment Testing and Maintenance', CRC Press, 2009

[3] McMillan R.B., 'Rotating Machinery', Marcel Dekker INC, 2004

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

The discipline content is reflected in engineering curricula and related technical domains. Relevant for industrial field application.

10. **Assessment**

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade (%)
10.4 Course	Answering specific questions on industrial systems maintenance topics or final testing at the end of the semeste	Online testing	70%
10.5 Laboratory	Handling experimental setups for system testing aimed at detecting and identifying faults	Ongoing assessment throughout the semester	30%

10.6 Minimum standard of performance:

Attendance at all laboratory sessions and passing the laboratory tests.

Grade calculation formula: N = E + L.

Minimum score required: N > 5/10.

Passing the final laboratory tests (which require attendance at all lab sessions) and achieving the minimum scores in both E (exam) and L (lab).

Date of completion	Lecturers	Title/ Surname/ Name:	Signature
01.08.2024	Course	Assoc. Prof. Dr. Eng. Claudiu Alexandru Oprea	
	Applications Seminar/ Laboratory/ Project	Assoc. Prof. Dr. Eng. Claudiu Alexandru Oprea	

Date of approval in the ETHM Department Council September 2024	**Head of Department:** Prof. Eng. MICU Dan Doru, PhD
Date of approval in the Faculty of Electrical Engineering Council September 2024	**Dean:** Assoc. Prof. Eng. CZIKER Andrei, PhD