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	20.00

2. Data about the subject

2.1	Subject name				Electrical and Electronical Measurements	
2.2	Course responsible/ lecturer				Prof.dr.ing.habil. Radu A. Munteanu; radu.a.munteanu@ethm.utcluj.ro	
2.3	Teachers in charge of Seminars/ Laboratory/ Project				Prof.dr.ing.habil. Radu A. Munteanu; radu.a.munteanu@ethm.utcluj.ro Asoc.Prof.dr.ing. Dan Iudean; dan.iudean@ethm.utcluj.ro	
2.4 Year of study	2	2.5 Semester	3	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		3.3 Laboratory	2	3.3 Project	
3.2 Total 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	22
(b) Supplementary study in the library, online and in the field	4
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	2
(e) Exams and tests	2
(f) Other activities	0
3.8 Total hours of individual study *[sum (3.7(a) to 3.7(f))]*	44
3.9 Total hours per semester *[sum of 3.4 and 3.8]*	100
3.10 Number of credit points	4

4. Prerequisites (where applicable)

4.1	Curriculum	Physics, Mathematics, Electric Circuit Theory
4.2	Competences	

5. Requirements (where appropriate)

5.1	For the course	

5.2	For the applications	Completion of the laboratory works is mandatory

6. Specific competences

Professional competences	1. Ability to identify, formulate, and solve engineering problems in a systemic approach. 2. Ability to apply engineering knowledge. 3. Ability to use modern engineering techniques, skills, and tools necessary for engineering practice. 4. Ability to design and conduct experiments, as well as analyze and interpret the information obtained. 5. Ability to approach and manage specific applications of general electrical engineering
Cross competences	1. Identification of the objectives to be achieved, the available resources, the conditions for their completion, the work stages, the working times, the deadlines and the associated risks. 2. Responsible execution of professional tasks.

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 creates and/or executes a plan or specification for the design of industrial systems, materials, products or a production plan, based on aesthetic and/or functional design concepts. The student/graduate explains the wiring diagrams that show the connections between the devices, such as electrical and signal connections.
Responsibility and autonomy	The student/graduate selects and uses bibliographic sources specific to the field. The student/graduate demonstrates autonomy in learning specific engineering issues.

8. Discipline objectives (based on specific competencies acquired)

8.1	General objective	The aim of the subject is to achieve the student's first engineering contact with electrical measurement techniques.
8.2	Specific objectives	After completing the course, students will be able to: • Build a measurement setup • Know how to read the indications of a measuring device • Know how to calculate the errors related to the measurement process

9. Contents

9.1. Course (Lectures)	Number of hours	Teaching methods	Additional remarks

1	Introduction to measurement theory. Units of measurement. Direct and indirect measurements. Organization of measurement systems.	2	Onsite or online teaching (according to regulations in force), presentation, interactive means	The teaching process uses multimedia presentations (powerpoint), onsite or online interaction (according to regulations in force) with students on the issues addressed, materials distributed to students, consultation hours, case studies.
2	Measurement errors and uncertainties. Quantities characteristic of measuring instruments.	2		
3	Analog instruments. Equation of motion of analog instruments. Dynamic behavior of measuring devices.	2		
4	Magnetoelectric devices and applications; ammeters, voltmeters, galvanometers, ohmmeters and megohmmeters.	2		
5	Electrodynamic devices and applications; ammeters, voltmeters, wattmeters, varmeters, cosfimeters and the electrodynamic meter.	2		
6	Standards (current intensity, voltage, resistance, capacitance, inductance, frequency, magnetic field intensity).	2		
7	Direct current bridges.	2		
8	Alternating current bridges.	2		
9	DC and AC compensators.	2		
10	The oscilloscope.	2		
11	Power measurement in single-phase circuits. Specific errors.	2		
12	Power measurement in three-phase circuits. Specific errors.	2		
13	Digital measuring devices.			
14	Numerical measurement of time and frequency.			

Bibliography

[1] R. Munteanu – Electrical and Electronic Measurements, Course Notes.

[2] R. Munteanu, col., Electrotechnics and energy converters, Mediamira Publishing House, Cluj-Napoca, 1997.

[3] I. Târnovan, - Metrology and electrical instrumentation, Mediamira Publishing House, 2003.

[4] R Munteanu jr., col. – Transducers for measurement systems, Mediamira Publishing House, 2003.

[5] Dan Iudean, Radu Munteanu jr., Mircea Buzdugan, Eudor Flueraș, Alex Crețu - "Electrical and electronic measurements – Laboratory guide"-, Mediamira Publishing House, 2016.

[6] Bird, J. - "Electrical Circuit Theory and Technology", Elsevier, Oxford, 2004.

[7] Webster, J., Eren, H. – "Measurement, Instrumentation and Sensors Handbook" CRC Press 2014.

9.2. Applications - Seminar /Laboratory/Project		Number of hours	Teaching methods	Additional remarks
1	Laboratory 1. Presentation of the Electrical and Electronic Measurements laboratory, equipment, labor protection standards.	2	Onsite or online teaching (according to regulations	The teaching process uses multimedia presentations (powerpoint),
2	Laboratory 2. Using analog measuring instruments	2		
3	Laboratory 3. Use of digital measuring devices	2		

4	Laboratory 4. Extending the measuring range of analog measuring devices	2	in force), presentation , interactive means	onsite or online interaction (according to regulations in force) with students on the issues addressed, materials distributed to students, consultation hours, case studies.
5	Laboratory 5. Measurements in single-phase alternating current circuits	2		
6	Laboratory 6. Measurements in three-phase alternating current circuits	2		
7	Laboratory 7. Direct current bridges	2		
8	Laboratory 8. Alternating current bridges	2		
9	Laboratory 9. Current transformers	2		
10	Laboratory 10. Q-meter	2		
11	Laboratory 11. Measurement of R,L,M,C parameters	2		
12	Laboratory 12. Specific measurements with the analog oscilloscope	2		
13	Laboratory 13. Specific measurements with the digital oscilloscope	2		
14	Laboratory 14. Laboratory homework session - colloquium	2		

Bibliography

[1] R. Munteanu – Electrical and Electronic Measurements, Course Notes.

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[3] I. Târnovan, - Metrology and electrical instrumentation, Mediamira Publishing House, 2003.

[4] R Munteanu jr., col. – Transducers for measurement systems, Mediamira Publishing House, 2003.

[5] Dan Iudean, Radu Munteanu jr., Mircea Buzdugan, Eudor Flueraș, Alex Crețu - "Electrical and electronic measurements – Laboratory guide"-, Mediamira Publishing House, 2016.

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[7] Webster, J., Eren, H. – "Measurement, Instrumentation and Sensors Handbook" CRC Press 2014.

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

The content of the discipline is consistent with what is taught in other electrical faculties, both at the Technical University and at other university centers in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held with representatives of the Cluj industrial and business environment.

11. Assessment

Activity type	11.1 Assessment criteria	11.2 Assessment methods	11.3 Weight in the final grade (%)
11.4 Course		Written exam	100
11.5 Laboratory		Laboratory colloquium - oral	0
11.5 Project			
11.6 Minimum standard of performance: Laboratory colloquium promotion (pass/fail), Exam promotion (grade>5)			

Date of completion	Lecturers	Title/ Surname/ Name:	Signature
September 2025	Course	MUNTEANU Radu Adrian	
	Applications Seminar/ Laboratory/ Project	IUDEAN Dan	

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