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	27.00

2. Data about the subject

2.1	Subject name			Transducers	
2.2	Course responsible/ lecturer			Assoc. Prof. Eng. Titus Crisan, PhD titus.crisan@ethm.utcluj.ro	
2.3	Teachers in charge of Seminars/ Laboratory/ Project			Assoc. Prof. Eng. Bogdan Tebrean, PhD tebrean.bogdan@ethm.utcluj.ro	
2.4 Year of study	II	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*				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	14
(b) Supplementary study in the library, online and in the field	14
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	12
(d) Tutoring	2
(e) Exams and tests	2
(f) Other activities	
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, Electrical and Electronic Measurements
4.2	Competences	

5. Requirements (where appropriate)

5.1	For the course	Cluj-Napoca on site/online (if applicable)
5.2	For the applications	Cluj-Napoca on site/online (if applicable)

6. Specific competences

Professional competences	Ability to use modern engineering techniques, skills, and tools required for engineering practice Ability to design and conduct experiments, as well as to analyze and interpret the obtained data
Cross competences	Flexibility in approaching and applying the latest technologies within the relevant fields of expertise Ability to work in interdisciplinary and multidisciplinary teams, communicate effectively, and understand professional and ethical responsibilities

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 develops analog and digital, electrical and electronic circuits, systems and products. The student/graduate explains wiring diagrams that show connections between 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	Knowledge of the field of non-electrical measurements, including main quantities and measurement methods, fundamental transducers, and the integration of sensors into modern technological systems
8.2	Specific objectives	Optimal selection of transducers for a given practical application Implementation of measurement systems for one or more non-electrical quantities Evaluation of measurement accuracy Optimization of measurement systems

9. Contents

9.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	Sensors. Transducers. Classifications. Measurable non-electrical quantities	2	Teaching at the board, presentations, and interactive methods Online – interactive presentations on virtual platforms (Microsoft Teams)	
2	Displacement measurement: analog and digital transducers – resistive, inductive, capacitive, photoelectric, Hall effect	2		
3	Optical fibers: applications in displacement measurement	2		
4	Level measurement. Surface roughness measurement	2		
5	Proximity sensing devices and circuits. Measurement of thickness and coating layers	2		
6	Resistive and semiconductor strain gauge transducers: relationships, parameters, influencing factors, specific measurement circuits, applications	2		
7	Galvanomagnetic transducers: general principles, applications	2		
8	Measurement of mechanical quantities: general principles. Mass measurement	2		
9	Measurement of angular and linear velocities. Torque measurement	2		
10	Pressure measurement. Flow measurement	2		
11	Measurement of photometric quantities	2		
12	Measurement of material properties: pH, humidity, conductivity, polarographic and chromatographic analysis	2		
13	Temperature measurement	2		
14	Measurement of main biological quantities	2		

Bibliography

1. Dragomir,N.D., col. – Măsurarea electrică a mărimilor neelectrice. Vol.1 - 4 : Măsurarea mărimilor geometrice. Măsurarea mărimilor termice şi fotometrice, Măsurarea mărimilor mecanice Ed.Mediamira, Cluj-Napoca, 1999 - 2004.

2. Webster, John G. et al. - Measurement, Instrumentation and Sensors - CRC Press, Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300 Boca Raton, FL 33487-2742, 2015

8.2. Applications - Seminar /Laboratory/Project		Number of hours	Teaching methods	Additional remarks
1	Measurement of linear and angular displacements	4	Practical work using dedicated setups for each	
2	Compensators	2		
3	Mass measurement	2		
4	Strain measurement (tensometry)	2		

5	Measurement of angular velocities	2	laboratory activity. Virtual laboratory work conducted in LabVIEW. Standalone virtual laboratory activities.	
6	Measurement of material properties: pH, humidity, conductivity	2		
7	Measurement of photometric quantities	2		
8	Temperature measurement	2		
9	Temperature control	2		
10	Pressure measurement	2		
11	Level measurement	2		
12	Study of Hall effect transducers	4		

Bibliography

1. Https:\\users.utcluj.ro\~scrisan - Lucrări de laborator: măsurarea mărimilor neelectrice
2. Dragomir,N.D., col. – Măsuri şi traductoare. Indrumator de laborator. Vol.2 :Masurarea marimilor neelectrice. Lito IPC, Cluj-Napoca, 1986.
3. Munteanu, R., col. – Aparate electronice pentru masurare si control. Indrumator de laborator. Lito IPC, Cluj- Napoca, 1991.

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

The course content is aligned with what is taught in other electrical engineering faculties both within the Technical University and in other academic centers in Romania and abroad. To better adapt the course content to labor market requirements, meetings have been held with representatives of the local socio-economic environment in Cluj.

11. Assessment

Activity type	11.1 Assessment criteria	11.2 Assessment methods	11.3 Weight in the final grade (%)
11.4 Course	Knowledge and understanding of the content; ability to explain phenomena and the operation of measurement systems	On-site – Oral exam / Online – Quiz via Microsoft Teams	100%
11.5 Application	Knowledge of laboratory work and equipment; performing measurements; interpretation of results	Laboratory colloquium	Pass/Fail Condition for admission to the exam
11.6 Minimum standard of performance: Correct completion of each subject at the level required for a passing grade (5).			

Date of completion	Lecturers	Title/ Surname/ Name:	Signature
September 2025	Course	Assoc. Prof. Eng. Titus Crisan, PhD	
	Applications Seminar/ Laboratory/ Project	Assoc. Prof. Eng. Bogdan Tebrean	

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