



SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Eaculty	Faculty of Electronics, Telecommunications and information
1.2 Faculty	Technology
1.3 Department	Applied Electronics
1.4 Field of study	Electronic Engineering, Telecommunications and Information
1.4 Field of Study	Technologies
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Applied Electronics / Engineer
1.7 Form of education	Full time
1.8 Subject code	47.00

2. Data about the subject

2.1 Subject name		Sens	Sensors and Transducers					
The2.2 Subject areaMet			eoretical area					
			Methodological area					
Ana				Analytic area				
2.3 Course responsible			Assoc. Prof. Pop Septimiu, PhD Eng. Septimiu.pop@ael.utcluj.ro					
2.4 Teacher in charge with seminar			Assoc. Prof. Pop Septimiu, PhD Eng. Septimiu.pop@ael.utcluj.ro					
/ laboratory / project	Eng. Flutur Alexandru, Phd. Stud. <u>Alexandru.Flutur@ael.utcluj.ro</u>							
2.5 Year of study	IV	2.6 Semester 1 2.7 Assessment E 2.8 Subject category DS/					DS/DI	

3. Estimated total time

3.1 Number of hours per week	4	of which:	3.2 course	2	3.3 seminar / laboratory	2
3.4 To Total hours in the curriculum	56	of which:	3.5 course	28	3.6 seminar / laboratory	28
Distribution of time						hours
Manual, lecture material and notes, b	oibliogra	aphy				36
Supplementary study in the library, online specialized platforms and in the field						
Preparation for seminars / laboratories, homework, reports, portfolios and essays					28	
Tutoring						2
Exams and tests					3	
Other activities:						
3.7 Total hours of individual study 69						

3.8 Total hours per semester	125
3.9 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 curriculum	Passive Electronics Components and Circuits, Fundamental Electronic Circuits,
4.1 cumculum	Basis of Data Acquisition System, Microcontroller, Digital Signal Processing
4.2 competence	Operating principles for electronic devices: resistor, capacitor, diode, operational amplifier, MOSFET and BJT transistors, Theoretical analyses of electronic circuits. Embedded systems,





Data acquisitions,
Data processing.

5. Requirements (where appropriate)

5.1. for the course	Amphitheatre, Cluj-Napoca
5.2. for the seminars / laboratories / projects	Laboratory no. 407 Observatorului, Cluj-Napoca

: :: 6.

Spec	ific competences				
	C2. Applying the basic methods for signal acquisition and processing				
	C2.1 Temporal, spectral and statistical characterization of signals.				
	• C2.2 Explaining and interpreting the methods of acquisition and processing of signals.				
	C2.3 Use of simulation environments for signal analysis and processing.				
	C2.4 Use of the specific method and tools for signal analysis.				
	C3. Application of the basic knowledge, concepts and methods regarding the architecture of				
	computing systems, microprocessors, microcontrollers, programming languages and techniques				
	 C3.4 Development of programs for a general and / or specific programming language, starting from the specification of the requirements and until the execution, debugging and interpretation of the results in correlation with the processor used. 				
ses	• C3.5 Projects involving hardware (processors) and software (programming) components.				
tenc	C4. To design and use low complexity hardware and software applications, specific to				
pet	applied electronics				
con	• C4.1 To define the concepts, principles and methods used in the fields of computer				
nal	programming, high-level and specific languages, CAD techniques for making electronic				
ofessio	modules, microcontrollers, computer systems architecture, programmable electronic systems, graphics, reconfigurable hardware architectures				
Pro	• C4.2 Explanation and interpretation of the specific requirements of the hardware and				
	software structures in the fields: computer programming, high-level and specific languages, CAD techniques for making electronic modules, microcontrollers, computer systems architecture, programmable electronic systems, graphics, reconfigurable hardware architectures				
	• C4.5 Design of dedicated equipment's in the fields of applied electronics, which use: microcontrollers, programmable circuits or computing systems with simple architecture,				
	including related programs				
	C6. To solve technological problems, specific to applied electronics				
	C6.1 Defining the principles and methods underlying the manufacture, adjustment, testing				

and troubleshooting of the appliances and equipment in the fields of applied electronics





N.A.

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

7.1 General objective	 To understand sensors and transducers working principle, Develop the skills in designing digital systems with Sensors, Presents the concept of measuring instruments and the methods of measurement and the use of different sensors and transducers. Improve the ability of student to analyze the measurements circuits from performance point of view.
7.2 Specific objectives	 Understanding sensors and transducers characteristics and linear and non-linear transfer function, Design digital systems with analog and digital convertor/ digital analog converter and microcontroller, Developing skills into measurement circuits, Understanding of a measuring chain, Sensor modeling using electrical equivalent circuit.

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
 Introduction into sensors transducers and actuators, description, parameters and classification, static and dynamic characteristics. 		
2. Resistive sensors for temperature, movement, strain and humidity measurement	Presentation,	
 Capacitive sensors for level, humidity and accelerometers – MEMS sensors 	heuristic conversation,	
4. Inductive sensor for proximity, movement LVDT and a special study of the vibrating wire transducer	exemplification, problem	Theoretical Exam Use of .ppt
 Sensors with semiconductor, temperature, hall, photodiode and piezoelectric transducers 	presentation, teaching exercise,	presentation, projector,
6. Force, Pressure and Flow sensors	case study,	blackboard
 Sensors for distance measurement- Optical encoder, Ultrasound method 	formative evaluation	
 Conditioning circuits for resistive sensors with current source and differential analog digital converter - AD7705 		
 Conditioning circuits for capacitive sensors – astable- multivibrator with single OpAmp and 555, 		





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	measuring small capacitive sensor's using switched capacitor solution					
10	Conditioning circuits with analog digital convertor					
	and frequency counter design methods					
11	Processing technique of data obtained from the	-				
	sensor measurement					
12	Interfaces and sensors network					
13	Sensorial systems Smart sensors Sensors and IoT	-				
14	Prenaration for the final exam					
Bibliog	ranhy					
Ribliog	raphy					
	Jacob Eradon, Handback of Modern concers, 1006, Sp	ringer Verlag, New Yer	-12			
1.	Jacob Fraden, Handbook of Modern Sensors. 1996, Sp	ringer-veriag, New Yor	к.			
2.	Analog Device, Transducer Interfacing Handbook, 1980	0, Massachusetts, USA				
8.2 Ser	ninar / laboratory / project	Teaching methods	Notes			
1.	Presentation of lab instruments and used sensors					
2.	Sensors characteristics, Use of nonlinear transfer					
	functions					
3.	Temperature sensor NTC, conditioning circuit with					
	current source					
4.	Resistive sensor - conditioning circuit for 3 Wire RTD					
	-online compensation technique					
5.	Capacitive sensor-measurement of capacitive sensor		Practical test the			
	using lab instruments, measuring small capacitive		students need to			
	sensor's using switched capacitor solution		develop an			
6.	Photodiode - Light detection	Didactic and	application with a			
7.	Optical encoder, decoding of quadrature output	experimental	sensor.			
	signals A-B	proot,	Use of laboratory			
8.	Distance measurement using ultrasound technique	toomwork	instrumentation,			
9.	Inductive sensor – voltage measurement	leanwork	experimental			
	transformers, Hall effect current sensor		boards,			
10	. Vibrating wire transducer –sensing and frequency		computers,			
	measurements					
11	. Industrial sensors with digital and analog 4-20mA					
	and 0-5V output signal					
12	. Sensors Network -RS485 standard-modbus, I2C					
	protocol					
13	. Lab recovery and finalization of laboratory activity					
14	. Laboratory test					
Bibliog	Bibliography					
Labs in printed format or electronic format:						
https:/	/drive.google.com/drive/folders/1p7J33n7upZGpFy18U	JgUlQrnZ_i5ax2Cs?usp	<u>=sharing</u>			
The lab	o is updated every year to be in accord with news in sen	sor theology.				

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





The discipline content and the acquired skills are in agreement with the expectations of the professional organizations and the employers in the field, where the students carry out the internship stages and/or occupy a job (in the field of applied electronics), and the expectations of the national organization for quality assurance (ARACIS).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The level of acquired theoretical knowledge and practical skills	 - 3 formative evaluation tests (problem solving) - Summative evaluation written exam (theory and problems) 	80%
10.5 Seminar/ Laboratory	The level of acquired knowledge and abilities	 Continuous formative evaluation practical lab test 	20%

10.6 Minimum standard of performance

Quality level:

Minimum knowledge:

- ✓ Knowledge about passive component: resistor, capacitance, inductance, diode
- ✓ Theoretical analyses of circuit
- \checkmark Understanding the operating principles of the fundamental electronic circuits;

Minimum competences:

- ✓ To be able to use the laboratory instruments like: Oscilloscope, Signal generator
- ✓ Knowledge in embedded system

Quantitative level:

- ✓ Need to be made and complete all labs
- ✓ Exam note and lab note to be minimum 5
- ✓ Final note is: 0,8*Exam +0,2*lab

Date of filling in: 10.06.2025	Responsible	Title Surname NAME	Signature
	Course	Assoc. Prof. Pop Septimiu, PhD Eng.	
	Applications	Assoc. Prof. Pop Septimiu, PhD Eng.	
		Phd. Stud. Alexandru.Flutur@ael.utcluj.ro	





Date of approval in the Department of Applied Electronics	Head of Department
18.06.2025	THE LINE OF THE LINE.
Date of approval in the Council of Faculty of Electronics, Telecommunications and Information Technology	Dean Prof. Ovidiu Aurel POP, PhD Eng.
25.06.2025	