

SYLLABUS

1. Information about the program

1.1 Higher education institution	Universitatea Politehnica Timișoara
1.2 Faculty ¹ / Department ²	Faculty Of Electronics, Telecommunications And Information Technologies / Applied Electronics Department
1.3 Field of study (name/code ³)	Electronics, Telecommunications and Information Technologies Engineering / 20/20/10
1.4 Study cycle	Master
1.5 Study program (name/code/qualification)	AUTOMOTIVE ELECTRONIC SYSTEMS/ 20/20/10 / 2152

2. Information about discipline

2.1a Name of discipline/The educational classe ⁴	Testing Techniques in the Development of Automotive Products / DF Tehnici de testare în proiectarea produselor automotiv						
2.1b Name of discipline in Romanian							
2.2 Coordinator (holder) of course activities	Lect. Septimiu Lica, B.Sc.Phys. M.Eng. Ph.D.						
2.3 Coordinator (holder) of applied activities ⁵	Lect. Septimiu Lica, B.Sc.Phys. M.Eng. Ph.D.						
2.4 Year of study ⁶	2	2.5 Semester	3	2.6 Type of evaluation	E	2.7 Regime of discipline ⁷	DOB

3. Total estimated time (direct activities (fully assisted), partially assisted activities and unassisted activities⁸)

3.1 Number of hours fully assisted/week	4 ,of which:	course	2	seminar/laboratory/project	2		
3.1* Total number of hours fully assisted/sem.	56 ,of which:	course	28	seminar/laboratory/project	28		
3.2 Number of on-line hours fully assisted/sem	24 ,of which:	course	16	seminar/laboratory/project	10		
3.3 Number of hours partially assisted/week	- ,of which:	project, research	-	training	-	hours designing M.A. dissertation	-
3.3* Number of hours partially assisted/ semester	- ,of which:	project of research	-	training	-	hours designing M.A. dissertation	-
3.4 Number of hours of unassisted activities/ week	4.93 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field				1.5	
		Study using a manual, course materials, bibliography and lecture notes				1.5	
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays				1.9 3	
3.4* Total number of hours of unassisted activities/ semester	69 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field				21	
		Study using a manual, course materials, bibliography and lecture notes				21	
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays				27	
3.5 Total hrs./week ⁹	8.93						
3.5* Total hrs./semester	125						
3.6 No. of credits	5						

4. Prerequisites (where applicable)

4.1 Curriculum	<ul style="list-style-type: none"> • Electronic Equipment Testing • Programming
4.2 Learning outcomes	<ul style="list-style-type: none"> • Good command of computers

5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> • A classroom with at least 30 seats equipped with a video projector.
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5.2 to conduct practical activities	<ul style="list-style-type: none"> • A laboratory room equipped with workstations capable of running simulation and testing environments, fitted with a whiteboard and a video projector.
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6. Learning outcomes acquired through this discipline

Knowledge	<ul style="list-style-type: none"> • C2. The student/graduate explains concepts and methods of research and industrial development applicable to electronics, including applied mechanics, testing methods for electrical equipment, and procedures for testing electronic components and systems. • C5. The student/graduate explains the principles and technologies of automation as applied to industrial processes. • C11. The student/graduate is familiar with processes for the analysis and characterization of microsystems, including testing and validation techniques. • C15. The student/graduate is familiar with testing procedures and standards applicable to power electronic systems, as well as engineering solutions for performance optimization. • C18. The student/graduate is familiar with procedures and standards for testing, prototyping, and monitoring the production of sensors and sensor-based equipment.
Skills	<ul style="list-style-type: none"> • A4. The student/graduate prepares technical reports and project documentation, integrating testing data, comparative analyses, and implementation recommendations. • A5. The student/graduate drafts technical reports and project documentation in compliance with engineering standards. • A6. The student/graduate applies testing and validation procedures for electronic products, systems, and components. • A7. The student/graduate analyzes and interprets experimental data using statistical techniques and engineering methods. • A8. The student/graduate uses dedicated software for data analysis, interpreting information derived from industrial processes. • A9. The student/graduate designs control systems for the monitoring and optimization of industrial processes. • A10. The student/graduate tests sensors, applying verification and performance validation procedures. • A11. The student/graduate operates remote-control equipment, integrating it into monitoring systems. • A13. The student/graduate applies testing procedures for electronic products and systems, assessing their compliance and reliability. • A15. The student/graduate analyzes and interprets experimental and operational data to optimize industrial equipment performance. • A17. The student/graduate presents analytical results through technical reports and scientific communications, using modern representation and visualization tools. • A19. The student/graduate applies experimental methods for testing, validating, and optimizing microsystem performance. • A21. The student/graduate tests power electronic systems, applying verification and performance validation procedures. • A25. The student/graduate tests sensors, applying verification and performance validation procedures.

Responsibility and autonomy	<ul style="list-style-type: none"> • RA3. The student/graduate ensures quality and professional ethics in the design and testing of electronic systems, in compliance with international and national regulations. • RA5. The student/graduate assumes responsibility for preparing and communicating technical reports to stakeholders. • RA8. The student/graduate demonstrates autonomy in the use of analysis software and in decision-making regarding the design and testing of equipment. • RA9. The student/graduate coordinates multidisciplinary teams for the design, implementation, and testing of monitoring systems. • RA14. The student/graduate assumes responsibility for the quality of design and testing of power electronic systems, ensuring compliance with technical and safety standards. • RA16. The student/graduate collaborates with other engineers in cross-functional contexts, coordinating testing processes and proposing solutions to identified deficiencies. • RA17. The student/graduate assumes responsibility for the quality and functionality of designed and tested sensors.
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7. Objectives of the discipline (based on the grid of learning outcomes acquired)

- The course aims to provide students with knowledge of advanced methods for testing electronic modules at various stages of development and production, to develop skills for generating test scenarios, and to acquire abilities for designing and building test benches.
- The course seeks to familiarize students with techniques and equipment for testing automotive electronic systems.
- The course presents methods for generating test cases for testing automotive electronic systems.
- The goal is for students to acquire skills in designing and implementing strategies for automated testing, boundary testing, and embedded systems testing.
- The course contributes to developing the skills needed for systematic planning, development, and implementation of test cases for embedded automotive systems.

8. Content

8.1 Course	Number of hours	Of which online	Teaching methods
Testing during the development of an electronic module automotive:			Lecture supported by slides, explanation, conversation, case study, problem-based learning, comparative analysis, Virtual Campus, email, and various electronic materials.
- Hardware / software development models, Test levels, Types of tests.	2	0	
- Testing techniques: testing based on specifications versus structural testing	2	0	
- Test management: Organization, Planning and estimation, Monitoring and control, Risk management	2	0	
Test automation: opportunity and objectives, definition of generic architecture, choice of components / interfaces / development environments	2	0	
Implementation of stands for automatic testing	2	0	
Development of automated testing solutions, reports and metrics, porting of manual solutions in automated environments	2	0	
Hardware testing of embedded systems.	2	2	
Design for testability.	2	2	
Methods and standards for boundary-scan testing, Built-In self-testing implementation	2	2	
Qualification of components for the automotive industry.	2	2	
Stress tests for the qualification of passive components, semiconductor devices and integrated circuits. Aging tests.	2	2	
Qualification methods and quality standards	2	2	
Electromigration. Fundamentals	2	2	
Testing techniques, design rules	2	2	

9.4 Course	<ul style="list-style-type: none"> - Knowledge of methods used in testing systems during the development cycle - Ability to use adequacy of the notions taught for defining automated testing strategies. - Understanding case studies on design to ensure testability and boundary-scan testing. - Ability to elaborate practical advanced testing solutions 	Theoretical knowledge is assessed through a written exam lasting 2 hours, which can be retaken under the conditions specified by the regulations. The exam paper includes multiple-choice theoretical questions and a design problem with 4 sub-parts.	50 %
9.5 Applied activities	S:		
	L: <ul style="list-style-type: none"> - Ability to design an automatic test stand for automotive electronic modules - Ability to design and implement a test plan for an automotive system - Knowledge and application of the notions presented in the course for the implementation of border testing and self-testing. - Ability to develop automated testing applications using dedicated environments. 	At the end of each set of laboratory works, the degree of mastering the practical knowledge and solving the tasks imposed by a test to solve a design problem is verified. The weighted average of the tests is the grade for the activity along the way	50 %
	P:		
	Pr:		
	Tc-R¹⁴:		
9.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified ¹⁵)			
<ul style="list-style-type: none"> • The composition of the exam subjects considers that half of them refer to basic aspects regarding testing during the development cycle of electronic systems, automation of testing, hardware testing of embedded systems, qualification of components for the automotive industry. • The design problem also contains a section of medium difficulty regarding the basic aspects of the testing process. • The treatment of the above-mentioned issues ensures the minimum level for promotion. 			

Date of completion

24/09/2025

**Course coordinator
(signature)**

Lect. Septimiu Lica. PhD

**Coordinator of applied activities
(signature)**

Lect. Septimiu Lica. PhD

**Head of Department
(signature)**

Assoc. Prof. Mircea Băbăiță PhD

**Date of approval in the Faculty
Council ¹⁶**

7.10.2025

**Dean
(signature)**

Prof. Cătălin Căleanu PhD