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]			Modern Programming Techniques /DF				
2.1b Name of discipline in Romanian			Tehnici moderne de programare				
2.2 Coordinator (holder) of course activities			Prof.dr.ing. Aurel Gontean				
2.3 Coordinator (holder) of applied activities[5]			Prof.dr.ing. Aurel Gontean				
2.4 Year of study[6]	2	**2.5** Semester	3	**2.6** Type of evaluation	V	**2.7** Regime of discipline[7]	DOP

3. Total estimated time (direct activities (fully assisted), partially assisted activities and unassisted activities[8])

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	,of which:	course		seminar/laboratory/project			
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					2
		Study using a manual, course materials, bibliography and lecture notes					2
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					0.93
3.4* Total number of hours of unasssited asctivities/ semester	69 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field					28
		Study using a manual, course materials, bibliography and lecture notes					28
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					13
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	• Object-oriented programming, Programming languages
4.2 Learning outcomes	• Structure of a digital system, HDL

5. Conditions (where applicable)

5.1 of the course	• Classroom equipped with projector
5.2 to conduct practical activities	• Laboratory with PCs, Internet network

6. **Learning outcomes** acquired through this discipline

Knowledge
C5. The student/graduate explains the principles and technologies of automation as applied to industrial processes **C7. The student/graduate explains mathematical and physical methods used in the modeling and analysis of industrial processes** **C16. The student/graduate demonstrates advanced knowledge of the operating principles, typologies, and applications of sensors.** • **C17. The student/graduate explains methods and techniques for designing sensors and integrated sensor systems within complex products**

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Skills	• **A2. The student/graduate conducts scientific research in electronics, developing innovative methods and solutions for circuits, semiconductors, and advanced technological applications.** • **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.** • **A7. The student/graduate analyzes and interprets experimental data using statistical techniques and engineering methods. .**
Responsibility and autonomy	• **RA2. The student/graduate demonstrates autonomy in leading scientific research and making complex engineering decisions, coordinating multidisciplinary technical teams.** RA4. The student/graduate promotes innovation and lifelong learning, integrating scientific and technological progress into research and development activities. RA5. The student/graduate assumes responsibility for preparing and communicating technical reports to stakeholders. • RA6. The student/graduate engages in lifelong learning, continuously updating competences in line with scientific and technological progress..

7. **Objectives of the discipline** (based on the grid of learning outcomes acquired)

- Understanding modern computer system architecture, with an emphasis on the design and operation of essential hardware components
- Developing parallel and concurrent programming skills necessary for the efficient exploitation of multicore and multiprocessor architectures.
- Developing the ability to analyze, design, and optimize the performance of computing systems using theoretical models and specific tools.
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8. **Content**

8.1 Course	Number of hours	Of which online	Teaching methods
CPU architecture	2		

CPU architecture	2		Interactive, projector, PPT
Pipeline architecture Pipeline architecture Pipeline architecture	2 2 2		
Parallel programming – principles Parallel programming – advantages Parallel programming – challenges	2 2 2		
Traffic lights	2		
Monitors Monitors	2 2		
Designing an ALU	2		
Flynn's taxonomy. SIMD, MIMD models	2		
Resolving limited memory access bandwidth	2		

Bibliography[10]

1. Shuangbao Paul Wang, Computer Architecture and Organization, Ed. Springer, 2021
2. William Stallings, Computer Organization and Architecture, Designing for Performance, 11th Edition, Pearson, 2019
3. Alan D. George, Lois Wright Hawkes, Microprocessor-Based Parallel Architecture for Reliable Digital Signal Processing Systems, CRC Press, 2022
4. M. Ben-Ari, Principles of Concurrent and Distributed Programming, 2nd Edition, Pearson 2006

8.2 Applied activities[11]	Number of hours	Of which online	Teaching methods
Application – biometrics – Face recognition Application – biometrics – Fingerprint recognition Application – biometrics – Iris recognition Application – biometrics – Voice recognition Application – biometrics – Hand geometry recognition	2 2 2 2 2		Interactive, laboratory, projector, PC, Internet
Parallel programming – application 1 Parallel programming – application 2 Parallel programming – application 3 Parallel programming – application 4 Parallel programming – application 5 Parallel programming – application 6 Parallel programming – application 7 Parallel programming – application 8	2 2 2 2 2 2 2 2		
Presentation of results			

	Bibliography[12] 1. M. Ben-Ari, Principles of Concurrent and Distributed Programming, 2nd Edition, Pearson, 2006 2. Face Recognition Across the Imaging Spectrum, Ed Thirimachos Bourlai, Springer, 2024 3. Peter Pacheco, Matthew Malensek, An Introduction to Parallel Programming 2nd Ed, Morgan Kaufmann, 2020

9. Evaluation

Type of activity	**9.1** Evaluation criteria[13]	**9.2** Evaluation methods	**9.3** Share of the final grade
9.4 Course	Written examination consisting of theoretical questions related to the topics presented in the courses	Written exam	66%
9.5 Applied activities	**S:**		
	L: Individual testing based on parallel programming principles/implementation of a biometric application. Active participation of students in practical activities related to the discipline.	Individual testing, ongoing assignments	34%
	P:		
	Pr:		
	Tc-R[14]:		
9.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified[15]			
• Fundamentals of parallel data processing, CPU and pipeline architecture, ALU design principles .			

Date of completion 24.09.2025	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
Head of Department (signature)	**Date of approval in the Faculty Council** [16] 7.10.2025	**Dean (signature)**