SYLLABUS

1. Information about the program

1.1 Higher education institution	Universitatea Politehnica Timișoara
1.2 Faculty[1] / Department[2]	Electronics Telecommunications and Information Technologies/ Communications
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)	Communications Networks Engineering / 20.20.10

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.eng. Aurel Gontean						
2.3 Coordinator (holder) of applied activities[5]	Prof.dr.eng. Aurel Gontean						
2.4 Year of study[6]	1	**2.5** Semester	1	**2.6** Type of evaluation	E	**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			0/2/0
3.1* Total number of hours fully assisted/sem.	56 ,of which:	course	28	seminar/laboratory/project			0/28/0
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	4.9 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field					1
		Study using a manual, course materials, bibliography and lecture notes					1.9
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					2
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					14
		Study using a manual, course materials, bibliography and lecture notes					27
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					28
3.5 Total hrs./week[9]	8.9						
3.5* Total hrs./semester	125						
3.6 No. of credits	5						

4. Prerequisites (where applicable)

4.1 Curriculum	• Object-oriented programming, Programming languages C, C++
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	• C2. The student/graduate understands the principles of electronic circuits and architectures • C6. The student/graduate understands algorithms and structures for data processing • C10. The student/graduate understands the concepts of traffic, bandwidth and QoS • CT1. The student/graduate knows ethical norms and citation rules • CT2. The student/graduate knows the resources and methods of continuing education
Skills	• A2. The student/graduate develops schemes and integrates hardware/software components • A6. The student/graduate programs and optimizes scalable applications • A10. The student/graduate assesses network needs and optimizes resources • A12. The student/graduate configures and optimizes ICT resources • AT1. The student/graduate applies rules of academic integrity • AT2. The student/graduate communicates results in a professional, clear, coherent and correct manner in the form of reports, documentation and scientific papers
Responsibility and autonomy	• RA2 The student/graduate assumes responsibility for the performance and reliability of the designed system • RA6 The student/graduate assumes responsibility for the functionality and security of applications • RA10 The student/graduate proposes solutions for streamlining traffic and manages resources • RA12 The student/graduate is responsible for the stability and performance of systems managed • RAT1. The student/graduate respects and promotes standards of ethics and professional integrity in all stages of research • RAT3. The student/graduate participates in the dissemination of knowledge through research activities and scientific communication.

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	4		Interactive, projector, PPT
Pipeline architecture	6		
Parallel programming – principles, advantages, challenges	6		
Traffic lights	3		
Monitors	3		
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	12		Interactive, laboratory, projector, PC, Internet
Application - Parallel programming example	12		
Presentation of results	4		

	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	Course coordinator (signature)	Coordinator of applied activities (signature)
25.09.2025		
Head of Department (signature)	**Date of approval in the Faculty Council** [16]	**Dean (signature)**
	07.10.2025	