COURSE SHEET
Distributed Computing - Principles and Algorithms
Academic year 2022-2023

1. About the program

1.1	University	Universitatea din Piteşti
1.2	Faculty	Sciences, Physical Education and Computer Science
1.3	Department	Mathematics-Computer Science
1.4	Field of study	Informatics
1.5	Cycle of studies	Master
1.6	Study Program / Qualification	Advanced techniques for information processing/ Advanced techniques for information processing

2. Discipline data

2.1	Name of the discipline				**Distributed Computing - Principles and Algorithms**					
2.2	The holder of the course activities				Tudor Bălănescu					
2.3	Holder of laboratory activities				Tudor Bălănescu					
2.4	Year of study	2	2.5	Semester	2	2.6	Type of assessment	E	2.7 Discipline regimen	O

3. Estimated total time

3.1	Number of hours per week	4	3.2	of which course	2	3.3 laboratory	2
3.4	Total hours of the curriculum	48	3.5	of which course	24	3.6 laboratory	24

Distribution of the time fund	hours
Study by textbook, course support, bibliography and notes	56
Additional documentation in the library, on specialized electronic platforms and in the field	46
Preparation of seminars/ laboratories, themes, papers, portfolios, essays	40
Tutoring	6
Examination	4
Other activities.....	-

3.7	Total hours of self-study	152
3.8	**Total hours per semester**	**200**
3.9	**Number of credits**	**8**

4. Preconditions (where applicable)

4.1	Curriculum	-
4.2	Skills	-

5. Conditions (where applicable)

5.1	Conduct of the course	Room with video projector
5.2	Conducting the seminar/laboratory	Room with video projector and computer equipment

6. Acquired specific skills

Professional skills	Operation with problems of consensus, communication, ressource allocation and synchronizarion of distributed computer suystems. Skills to operate with theoretical concepts and practical methods regarding the process of design and implementation of distributed systems. Knowledge of theoretical procedures for analyzing the time and communication efficiency of distributed systems. Realization of it projects in a distributed context. Conceiving, designing and implementing of software components distributed over a network. .
Transversal competences	Applying the rules of organized and efficient work, of responsible attitudes towards the scientific-professional field, for the creative capitalization of one's own potential, respecting the principles and norms of professional ethics; Efficiently carrying out the activities organized in an interdisciplinary team by assuming execution and leadership functions, with the development of empathic capacities of inter-personal communication, networking and collaboration with various groups; Elaboration of own professional development project; the use of effective methods and techniques for learning, information, research and capacity development, for valuing knowledge, for adapting to the requirements of a dynamic society and for communicating in Romanian and English.

7. The objectives of the discipline

7.1 The general objective of the discipline	► The discipline has as general objective the acquisition by students of the basic knowledge, as well as of the advanced methods and techniques regarding the principles and algorithms for designing distributed software systems.
7.2 Specific objectives	Cognitive objectives: ► Knowledge of the timing model of distributed systems: synchronous, asynchronous or partially synchronous. ► Knowledge of the interprocess communication mechanisms: message passing and shared memory. *Procedural objectives:* ► Training skills for implementing the main algorithms used in the development of distributed

systems.

Attitudinal objectives:
▶ Rigor in the design, implementation and analyzing of distributed systems..

8. Contents

8.1. Course		Nr. hours	Teaching methods	Observations Resources used
1	Synchronous Network Model	2	lecture problematization algorithmization debate individual themes group work Explanation Description and exemplification Demonstration Heuristic Conversation Exercise	computer projector
2	Proof methods and complexity measures	2		
3	Leader Election	4		
4	Vertex Coloring	2		
5	BFS Tree Construction	2		
6	MST Construction	2		
7	Sorting Networks	2		
8	Counting Networks	2		
9	Shared Memory	2		
10	Communication complexity	4		

Bibliography
1. Nancy A. Lynch: *Distributed Algorithms.* Morgan Kaufmann Publishers*, 1996*
2. Roger Wattenhofer*: Principles of Distributed Computing,* Springer, 2016.

8.2. Applications – Seminar / Laboratory		Nr. hours	Teaching methods	Observations Resources used
1	LeLann-Chang_Roberts Algorithm	2	Explanation Description and exemplification Case study Exercise Problematization Individual themes Group work Debate	Network of computers
2	Hirchsberg-Sinclair Algorithm	4		
3	Breadth-First Search	2		
4	Minimum Spanning Tree	2		
5	Maximal Independent Set	2		
6	The Coordinated Attack Problem	4		
7	Dijkstra's Mutual Exclusion Algorithm	2		
8	The Backery Algorithm	4		
9	Dining Philosophers Problem	4		

Bibliography
1. Maurice Herlihy, Nir Shavit: The Art of Multiprocessor Programming, Elsevier 2008.
2. Christel Baier, Joost_Pieter Katoen: Principles of Model Checking, MIT Press, 2008

9. Corroborating the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers in the field related to the program

The competences acquired within the discipline allow the graduates to efficiently use algorithms and methodologies for design, implementation, verification and validation of distributed software systems.
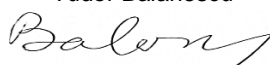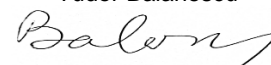
10. Evaluation

Activity Type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percent of final grade
10.4 Course	Final evaluation	Practical test (algorithms and problems)	50%
10.5 Seminar/ Laboratory	Activity (solving proposed problems) Homework	Verification of solutions, practical test Homework check	30% 20%
10.6 Minimum performance standard	* Marks of at least 5 for the laboratory activity, for the homework and for the final evaluation (50% solving the requirements); final grade at least 5. * Set of minimal knowledge for passing the final exam: - Knowledge of the main computational models studied; Knowledge of ways of adequate application and efficient implementation of these models in solving the proposed problems.		

Date of completion
23.09.2022

Course holder
Tudor Balanescu

Laboratory holder
Tudor Balanescu

Date of approval in the Department
23.09.2022

Director Department (provider)
Conf.univ.dr. Doru CONSTANTIN

Director Department (*beneficiary)*)
Conf.univ.dr. Doru CONSTANTIN