COURSE SHEET
Pattern Recognition
Academic year 2022-2023

1. About the program

1.1	University	University of 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				*Pattern Recognition*				
2.2	The holder of the course activities				Assoc. prof. PhD Doru Constantin				
2.3	Holder of laboratory activities				Assoc. prof. PhD Doru Constantin				
2.4	Year of study	2	2.5 Semester	1	2.6 Type of assessment	E	2.7	Discipline regimen	O

3. Estimated total time

3.1	Number of hours per week	3	3.2	of which course	2	3.3	laboratory	1
3.4	Total hours of the curriculum	42	3.5	of which course	28	3.6	laboratory	14

Distribution of the time fund	hours
Study by textbook, course support, bibliography and notes	40
Additional documentation in the library, on specialized electronic platforms and in the field	30
Preparation of seminars/ laboratories, themes, papers, portfolios, essays	30
Tutoring	4
Examination	4
Other activities.....	-

3.7	Total hours of self-study	108
3.8	**Total hours per semester**	**150**
3.9	**Number of credits**	**6**

4. Preconditions (where applicable)

4.1	Curriculum	
4.2	Skills	Ability to analyze and synthesize, programming skills

5. Conditions (where applicable)

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

6. Acquired specific skills

Professional skills	Operation with scientific concepts and methods in the field of information processing in information systems; Development of theoretical concepts and practical methods regarding the process of development and maintenance of computer applications; Advanced information processing; Realization of it projects in an interdisciplinary context; Conceiving, designing and implementing information systems; Management of information systems.
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 acquisition by students of the basic knowledge, methods and techniques regarding the *Pattern Recognition*, as well as the modalities of implementation and application to concrete situations.
7.2 Specific objectives	*Cognitive objectives:* ► Knowledge of the mathematical and computer fundamentals of the main concepts in the field of pattern recognition; knowledge of pattern recognition algorithms and methods; design of linear classifiers; ► Knowledge of linear feature extraction and dimensionality reduction systems; ► Knowledge of recognition algorithms based on modern techniques such as principal component analysis and independent component analysis. *Procedural objectives:* ► Training the skills to implement the main algorithms used in object recognition applications.

	Attitudinal objectives:
	► Rigor in modeling, design and implementation of pattern recognition algorithms.

8. Contents

8.1. Course		Nr. hours	Teaching methods	Resources used
1.	Introductory elements of pattern recognition	2	Explication Description and exemplification Demonstration Problematization Heuristic conversation Exercise	Blackboard Pen tablet Computer Video projector Documentary support E-learning platform Zoom
2.	Bayesian decision theory	2		
3.	Bayesian classifier for normal distributions	2		
4.	Estimation of density functions	2		
5.	Linear classifiers. Algorithms for designing linear classifiers in a supervised manner: Perceptron, MSE	4		
6.	Non-linear classification models	4		
7.	Karhunen-Loeve theorem and MSE optimal design of dimensionality reduction (compression/decompression) systems	4		
8.	Kernel methods, SVM model for linearly separable data	2		
9.	Concepts of clustering	2		
10.	Pattern recognition algorithms based on PCA and ICA	4		

Bibliography
1. Note de curs și laborator - *suport electronic* - Doru Constantin.
2. State, L., Paraschiv-Munteanu, I., *Introducere în teoria statistică a recunoașterii formelor*, Ed. Univ. Pitesti, 2009.
3. Bishop, C. M., *Pattern Recognition and Machine Learning*, Springer, 2006.
4. Zhu, X., Goldberg, A. B., *Introduction to semi-supervised learning*, Morgan Kauffman, 2010.
5. Sanguansat, P., *Principal Component Analysis*, InTech, 2012.
6. Theodoridis, S., Koutroumbas, K., *Pattern Recognition*, Elsevier, 2009.
7. Fukunaga, K., *Introduction to Statistical Pattern Recognition*, Morgan Kaufmann, 1999.

8.2. Applications – Laboratory		Nr. hours	Teaching methods	Observations Resources used
1	Implementation of Bayesian classification algorithms	2	Explication Description and exemplification Case study Exercise Debate	Blackboard Pen tablet projector E-learning platform Zoom
2	Implementation of algorithms for the estimation of density functions	2		
3	Implementation of algorithms for designing linear classifiers in a supervised manner	4		
4	Implementation of kernel algorithms and SVM model for linearly separable data	4		
5	Implementation of recognition algorithms based on PCA and ICA	2		

Bibliography
1. Note de curs și laborator - *suport electronic* - Doru Constantin.
2. State, L., Paraschiv-Munteanu, I., *Introducere în teoria statistică a recunoașterii formelor*, Ed. Univ. Pitesti, 2009.
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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 the models and techniques specific to pattern recognition in solving the requirements related to the practice and research in the field of informatics. The contents are correlated with those of similar disciplines in prestigious universities in the country and abroad (such as MIT) and adjusted after discussions with representatives of local IT employers (such as RoWeb, Lisa, Prodinf, Kepler, Osf, Endava).

10. Evaluation

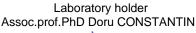| Activity Type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percent of final grade
10.4 Course	Final evaluation	Practical test (algorithms and problems)	50%
10.5 Seminar/ Laboratory	Participatory activity, Project Activity (solving proposed problems) Periodical evaluation	Verification of project, practical test	10% 40%
10.6 Minimum performance standard	* Minimum knowledge set for passing the final exam: knowledge of the fundamental principles of the pattern recognition field; knowledge of basic techniques and methods, implementations of basic algorithms used in recognition tasks.		

Date of completion   Course holder   Laboratory holder
15.09.2022   Assoc.prof.PhD Doru CONSTANTIN   Assoc.prof.PhD Doru CONSTANTIN

Date of approval in the Department   Director Department (provider)   Director Department (*beneficiary)*
15.09.2022   Assoc.prof.PhD Doru CONSTANTIN   Assoc.prof.PhD Doru CONSTANTIN