SYLLABUS

Data mining and knowledge discovery

University year 2025-2026

1. Information regarding the programme

1.1. Higher education institution	Babeş-Bolyai University Cluj-Napoca
1.2. Faculty	Faculty of Mathematics and Computer Science
1.3. Department	Department of computer science
1.4. Field of study	Computer science
1.5. Study cycle	Master
1.6. Study programme/Qualification	Data science for industry and society

2. Information regarding the discipline

2.1. Name of the discipline	**Data mining and knowledge discovery**					Discipline code	**MME8183**
2.2. Course coordinator				Research assistant PhD Limboi Sergiu-George			
2.3. Seminar coordinator				Research assistant PhD Limboi Sergiu-George			
2.4. Year of study	1	2.5. Semester	2	2.6. Type of evaluation	E	2.7. Discipline regime	Compulsory

3. Total estimated time (hours/semester of didactic activities)

3.1. Hours per week	**4**	of which: 3.2 course	**2**	3.3 seminar/laboratory/project	**1 lab + 1 project**
3.4. Total hours in the curriculum	56	of which: 3.5 course	28	3.6 seminar/laboratory/project	**28**

Time allotment for individual study (ID) and self-study activities (SA)	**hours**
Learning using manual, course support, bibliography, course notes (SA)	36
Additional documentation (in libraries, on electronic platforms, field documentation)	36
Preparation for seminars/labs, homework, papers, portfolios and essays	36
Tutorship	3
Evaluations	8
Other activities:	
3.7. Total individual study hours	**119**
3.8. Total hours per semester	**175**
3.9. Number of ECTS credits	**8**

4. Prerequisites (if necessary)

4.1. curriculum	Algorithms, data structures, statistics
4.2. competencies	Programming in high-level programming language

5. Conditions (if necessary)

5.1. for the course	Videoprojector
5.2. for the seminar /lab activities	Computers

6.1. Specific competencies acquired [1]

[1] One can choose either competences or learning outcomes, or both. If only one option is chosen, the row related to the other option will be deleted, and the kept one will be numbered 6.

Professional/essential competencies	• **programming in high-level languages** • **using artificial intelligence concepts and techniques to solve real-world problems**
Transversal competencies	• applying principles of organized and efficient work, adopting responsible attitudes toward the academic and scientific field, in order to creatively leverage one's own potential, while respecting the principles and norms of professional ethics

6.2. Learning outcomes

Knowledge	The student knows how to: • collect, analyze, and visualize data from diverse domains (financial, biological, medical) • apply data mining techniques • evaluate the quality of the algorithms used
Skills	The student is able to: • carry out data exploitation, discovery, and the innovation of analysis methods through interdisciplinary investigations • perform data preparation and data analysis
Responsibility and autonomy:	The student has the ability to work independently for: • collaboration within a team project • data collection • applying different data analysis methodologies

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• learning data mining concepts and techniques, and knowledge discovery
7.2 Specific objective of the discipline	• The student will learn various data analysis techniques and will apply these techniques to solve problems using specialized software systems and tools.

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction into data mining and knowledge discovery	Explanations Case study discussions	

2. Data preprocessing	Practical examples	
3. Data representation and feature extraction		
4. Unsupervised learning for data analysis		
5. Clustering techniques		
6. Applications of clustering		
7. Data vizualization		
8. Analysis of a complex AI project		
9. Recommender systems		
10. Text mining		
11. Image mining		
12. Invited speaker		
13. Project presentations		
14. Project presentations. Exam review.		
Bibliography		
1. S. Chakrabarti et al, Data Mining. Know It All, Morgan Kaufmann, 2009 2. J. Han, M. Kamber, Data Mining: Concepts and Techniques, 2nd Edition, Morgan Kaufmann, 2006. 3. D. Larose, Discovering Knowledge in Data. An Introduction to Data Mining, John Wiley & Sons, 2005. 4. P. Tan, M. Steinbach, V. Kumar, Introduction to Data Mining, Addison Wesley, 2006.		
8.2 Seminar / laboratory	Teaching methods	Remarks
1. Data collection and pre-processing	Explanations Case study discussions Practical examples	
2. Data mining tools		
3. Choose the research project		
4. Exploratory data analysis		
5. Apply clustering algorithms		
6. Enhancements for the project		
7. Research project evaluation		
Bibliography		
1. S. Chakrabarti et al, Data Mining. Know It All, Morgan Kaufmann, 2009. 2. J. Han, M. Kamber, Data Mining: Concepts and Techniques, 2nd Edition, Morgan Kaufmann, 2006. 3. Hector Cuesta, Dr. Sampath Kumar, Practical Data Analysis. 4. D. Larose, Discovering Knowledge in Data. An Introduction to Data Mining, John Wiley & Sons, 2005		

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- This course is included in the study programs of all major universities in Romania and abroad.
- The content of this course is considered important by IT companies.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	Knowledge of concepts and methods in the field of data analysis	Written exam	30%
		Research report and	20%

		presentation	
10.5 Seminar/laboratory	Apply data analysis techniques to real-world problems	Implementation and project presentation	50%
10.6 Minimum standard of performance			
• Each student must obtain a minimum grade of 5 for the written exam, the project, and the final grade. • To obtain the minimum grade of 5, the student must demonstrate mastery of the basic concepts of data preparation for analysis.			

11. Labels ODD (Sustainable Development Goals)[2]

Not applicable.

Date:
14.02.20265

Signature of course coordinator

PhD Limboi Sergiu-George

Signature of seminar coordinator

PhD Limboi Sergiu-George

Date of approval:
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Signature of the head of department

Assoc.prof.phd. Adrian STERCA

[2] Keep only the labels that, according to the *Procedure for applying ODD labels in the academic process*, suit the discipline and delete the others, including the general one for *Sustainable Development* – if not applicable. If no label describes the discipline, delete them all and write „*Not applicable*.".