COURSE SYLLABUS

1. Program information

Faculty	Faculty of Electrical Engineering and Computer Science
Department	Computer Science
Field of study	Computers and Information Technology
Cycle of studies	Master's Degree
Study Program	Artificial Intelligence & Social Robotics Applied to Global Health

2. Course information

Course name		**DATA WAREHOUSE AND DATA MINING**				
Year of study	1	Semester	1	Type of assessment	Exam	
Course regime	Course category by educational content DF – Fundamental, DS –Specialization, DC – Complementary					DF
	Course category by optionality: DOB – Compulsory, DOP – Optional, DFA – Elective					DOB

3. **Total estimated time** (hours allocated to teaching activities)

I a) Number of hours per week	3	Lecture	2	Seminar	-	Laboratory / practical work	1	Project	-
I b) Total number of hours per semester according to curriculum	42	Lecture	28	Seminar	-	Laboratory / practical work	14	Project	-

Distribution of time allocation per semester (hours)	No. hours
II. Individual study	105
III. Examination	3
IV. Other activities (specify):	-

Total individual study hours (II+III)	108
Total hours per semester (I.b+II+III+IV)	150
Number of credits	6

4. Specific competencies acquired

Transversal competencies	-
Professional / general competencies	CP4 – develop data processing applications CP5 – apply statistical analysis techniques CP6 – analyze big data CP7 – manage research data CP8 – establish data processes

5. Learning outcoms

Knowledge	**Skills**	**Responsibility and autonomy**
The student/graduate identifies, critically evaluates, and applies specialized concepts and methods from the field of artificial intelligence and advanced data analytics as a foundation for original thinking and/or research.	The student/graduate applies advanced supervised and unsupervised machine learning methods, effective feature selection techniques, and pattern extraction from relational, non-relational, and multimodal data to solve complex problems. The student/graduate evaluates the technical performance of trained models and exploration and optimization algorithms in large search spaces.	The student/graduate autonomously manages design and development activities by applying artificial intelligence techniques and taking responsibility for the validity of the mathematical, statistical, and scientific foundation.

6. **Course objectives** (derived from the grid of specific competencies acquired)

General objective of the course	Develop advanced skills for understanding and using concepts, methods, and technologies specific to data warehouses and data mining processes, with a view to efficiently collecting, organizing, storing, processing, and analyzing large volumes of data. Develop the ability to design and implement data warehouse architectures, as well as to apply data mining techniques for knowledge extraction, pattern identification, and decision support in real-world healthcare applications.

7. Teaching and learning content

Lectures	**No. of hours**	**Teaching methods**	**Remarks / Notes**
1. Introduction 1.1. The role of Data Warehouse and data mining in decision-making. Examples and discussions related to the field of global health. 1.2. General characteristics of a decision support system. 1.3. Useful data in the field of global health. Typology, characteristics, datasets.	2	Lecture, discussion, exemplification demonstration	
2. Presentation of the Data Warehouse concept: definition, characteristics, types and architectures 2.1. Data Warehouse vs. relational databases 2.2. The role of Data Warehouse in supporting decision-making, examples of applications.	2		
3. Multidimensional model 3.1. Dimensions, facts, and schemas used in designing a data warehouse 3.2. Specific metadata. Example	2		
4. Designing and implementation of a Data Warehouse 4.1. Methods for designing a data warehouse 4.2. Table spaces, tables, and partitioned tables 4.3. Indexes and partitioned indexes 4.4. Summary management: materialized views. 4.5. ETL process	2		
5. Knowledge Discovery in Data (KDD) 5.1. Definition, models 5.2. Knowledge representation: rules, decision trees, clusters, graphs, semantic networks 5.3. The importance of model readability and interpretability for decision support	2		
6. Data Mining 6.1. Definition, characteristics 6.2. Positioning the data mining within the process of discovering knowledge from data (KDD) 6.3. Examples of applications in the global health sector	2		
7. Preparing raw data for the data mining process 7.1. Data issues identification and cleaning: handling missing values, eliminating errors and inconsistencies. 7.2. Data transformation and normalization 7.3. Selecting and reducing the dimensionality of data relevant for exploration	2		
8. Classification 8.1. Definition 8.2. Algorithms (Decision Tree, Random Forest, Naive Bayes, KNN, neural networks, SVM) 8.3. Evaluating the performance of classification models using specific metrics 8.4. Case study – predicting the onset of cardiovascular disease	4		

9. Clustering 9.1. Definition 9.2. Clustering methods: k-means, k-medoids, DBSCAN 9.3. Clustering applications in patient segmentation.	2		
10. Association rules 10.1. Defining association rules and their role in identifying frequent relationships between data. 10.2. Algorithms: Apriori, FP-Growth. **10**.3. Case study in global health.	4		
11. Text mining 11.1. Definition, specific preprocessing operations 11.2. Application: sentiment and opinion analysis, emotion detection from various text sources: questionnaires, reviews, evaluations 11.3. Case study in global health	4		

Recommended minimal bibliography

1. Chistol, M., Danubianu, M. (2024). Automated Detection of Autism Spectrum Disorder Symptoms using Text Mining and Machine Learning for Early Diagnosis. International Journal of Advanced Computer Science & Applications, 15(2). https://thesai.org/Publications/ViewPaper?Volume=15&Issue=2&Code=IJACSA&SerialNo=64
2. Chistol, M., Danubianu, M., Bărîlă, A.L. (2023). Technology-Mediated Interventions for Autism Spectrum Disorder. International journal of advanced computer science & applications, 14(12). https://thesai.org/Publications/ViewPaper?Volume=14&Issue=12&Code=IJACSA&SerialNo=5
3. Nenad Jukic, Susan Vrbsky, Svetlozar Nestorov. (2016). *Database Systems: Introduction to Databases and Data Warehouses.* Prospect Press, 2016
4. Mohammed Zaki, Wagner Meira Jr. (2014). *Data Mining and Analysis: Foundations and Algorithms.* Cambridge University Press https://repo.palkeo.com/algo/information-retrieval/Data%20mining%20and%20analysis.pdf
5. R. Kimball. (2013). *The Datawarehouse Toolkit*, 3rd Ed., Wiley Computer Publishing.
6. Vaisman A., Zimany E. (2022). *Data Warehouse Systems*, Springer.
7. Han et al. (2022). *Data Mining: Concepts and Techniques,* 4th Ed., Morgan Kaufmann.

Application (Laboratory)	**No. of hours**	**Teaching methods**	**Remarks/ Notes**
The goal of the practical activities is to design, implement, and support the presentation of a project that will consist of a data mining process to solve a problem in the medical field. To this end, each student will identify a public dataset or create (generate) a dataset that will be the source of a process to solve a current problem in the health sector. The Altair AI Studio (formerly Rapidminer) environment will be used for laboratory work.			
Introductory session on designing and developing data mining systems using Altair AI Studio.	2	Practical works, experiments, conversation, case study	
Applying exploratory data analysis methods and implementing the preprocessing stage to improve data quality and transform it into sets suitable for the project objective.	4		
Selection of the method and application of the appropriate modeling technique. Evaluation of the models obtained.	2		
Applying models to new data and interpreting results	4		
Project defense, evaluation.	2	Demonstration	
Attendance at compulsory activities is regulated by the "Framework Regulations on Student Assessment." Compulsory practical activities scheduled during the semester may be made up in accordance with the provisions of these regulations. Practical activities scheduled during the semester may be equated with the completion and defense of highly complex projects related to the subject matter, with the agreement of the tenured teacher.			

Recommended minimal bibliography

1. Hofmann, M., Klinkenberg, R., Mierswa, I. (2013). RapidMiner: Data Mining Use Cases and Business Analytics Applications. https://dl.acm.org/doi/abs/10.5555/2543538
2. Altair AI Studio – free edition https://web.altair.com/desafio-machine-learning-baja-rm

4. Evaluation

Type of activity	Evaluation criteria	Evaluation methods	Weight in final grade
Final evaluation	Clear presentation of theoretical concepts and correct use of specific notions in data warehouse and data mining. Correct understanding of specialized methods in the field of artificial intelligence and advanced data analysis.	Written test, followed by oral verification of the extent to which the requirements in the written work are met.	50%
Evaluation of ongoing practical activities	The correct design and functional implementation of a complete data mining process aimed at solving a problem in the field of health.	Project evaluation, systematic observation	50%

Physical accessibility: activities are conducted in classrooms and laboratories accessible to wheelchair users via ramps/lifts (USV buildings C/D); **Accessibility of teaching materials:** documents are available in digital PDF format with selectable text and slides with large fonts; **Evaluation accessibility:** ongoing evaluation through projects; possibility of extended time for the written tests and oral verification.

Date	Academic title, Name, Surname, Signature of Course Instructor	Academic title, Name, Surname, Signature of Practical Work Instructor
23.09.2026	Prof. univ. dr. ing. Mirela DANUBIANU	Prof. univ. dr. ing. Mirela DANUBIANU

Date of approval	Academic title, Name, Surname, Signature of Program Coordinator
24.09.2026	Prof. univ. dr. ing. Radu-Daniel VATAVU

Date of departmental approval	Academic title, Name, Surname, Signature of Head of Department
24.09.2026	Prof. univ. dr. ing. Ovidiu-Andrei SCHIPOR

Date of Faculty Council Approval	Academic title, Name, Surname, Signature of Dean
25.09.2026	Prof. univ. dr. ing. Laurentiu-Dan MILICI