1. Information regarding the programme

1.1 Higher education institution	**Babeş-Bolyai University**
1.2 Faculty	**Faculty of Biology and Geology**
1.3 Department	**Department of Molecular Biology and Biotechnology**
1.4 Field of study	**Biology**
1.5 Study cycle	**Master**
1.6 Study programme / Qualification	**Bioinformatics applied in life sciences**

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)			**Data mining in biomedicine** **Extragerea cunoștințelor din baze de date pentru biomedicină**			
2.2 Course coordinator			**Lect. Adriana Coroiu, PhD**			
2.3 Seminar coordinator			**Lect. Adriana Coroiu, PhD**			
2.4. Year of study	**2**	2.5 Semester **3**	2.6. Type of evaluation	**E**	2.7 Type of discipline	**Elective**
2.8 Code of the discipline		**BME1136**				

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	**2**
3.4 Total hours in the curriculum	**56**	Of which: 3.5 course	**28**	3.6 seminar/laboratory	**28**

Time allotment:	hours
Learning using manual, course support, bibliography, course notes	24
Additional documentation (in libraries, on electronic platforms, field documentation)	18
Preparation for seminars/labs, homework, papers, portfolios and essays	16
Tutorship	8
Evaluations	4
Other activities:	

3.7 Total individual study hours	70
3.8 Total hours per semester	126
3.9 Number of ECTS credits	5

4. Prerequisites (if necessary)

4.1. curriculum	• Algorithms, data structures, statistics
4.2. competencies	• Average programming skills

5. Conditions (if necessary)

5.1. for the course	• Beamer • Online meeting platform	•
5.2. for the seminar /lab activities	• Attendance of a minimum of 90% of practical/ seminar classes, • Computers, specific development environment	•

6. Specific competencies acquired

Professional competencies	• Use of databases methodologies and design environments for particular problems • Quality evaluation of different database management systems in terms of structure, functionality and extensibility • Implementation of database projects	
Transversal competencies	• Application of efficient work rules and responsible attitudes towards the scientific domain, for the creative exploitation of one's own potential according to the principles and rules of professional ethics • Efficient conduct of activities organized in an interdisciplinary group and development of empathic capacity of interpersonal communication, networking and collaboration with diverse groups • Use of efficient methods and techniques for learning, information, research and development of abilities for knowledge exploitation, for adapting to the needs of a dynamic society and for communication in a widely used foreign language.	

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

7.1 General objective of the discipline	• To learn data mining and knowledge discovery concepts, methods and techniques
7.2 Specific objective of the discipline	• The students will learn various data analysis techniques and will apply these techniques for solving data mining problems using special software systems and tools.

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction	• Interactive exposure • Presentation • Explanation • Practical examples • Case-study discussions	
2. Concept description; Definitions		
3. Data Preparation		
4. Discovering, Ingesting, and Exploring Data		
5. Transforming Data into Analytics-Ready Data		
6. Data understanding		
7. Visualising data for explaratory analysis		
8-9. Unsupervised models for data visualisation		
10-12 Model Assessment and Validation		
12-14. Student presentations		

Bibliography
1. S. Chakrabarti et al, Data Mining. Know It All, Morgan Kaufmann, 2009.
2. K. Cios, W. Pedrycz, R. Swiniarski, L. Kurgan, Data Mining. A Knowledge Discovery Approach, Springer, 2007.
3. J. Han, M. Kamber, Data Mining: Concepts and Techniques, 2nd Edition, Morgan Kaufmann, 2006.
4. P. Tan, M. Steinbach, V. Kumar, Introduction to Data Mining, Addison Wesley, 2006.
5. D. Larose, Discovering Knowledge in Data. An Introduction to Data Mining, John Wiley & Sons, 2005.
6. Han, J., Kamber, M., Data Mining: Concepts and Techniques, 1st Edition, Morgan Kaufmann, 2000.
Weka system and documentation (http://www.cs.waikato.ac.nz/ml/weka/). Weka is a suite of machine learning / data mining software. It contains Java implementation for various mining algorithms, data preprocessing filters, and experimentation capabilities. Weka is free open-source software under the GNU General Public License (GPL).

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Data preprocessing	• Interactive exposure • Explanation	
2. Data Mining software tools		
3. SAS Visual Data Mining		

4-6. Data mining applications in biomedicine	• Conversation	
7. Students project presentations	• Didactical demonstration	

Bibliography

1. S. Chakrabarti et al, Data Mining. Know It All, Morgan Kaufmann, 2009.
2. K. Cios, W. Pedrycz, R. Swiniarski, L. Kurgan, Data Mining. A Knowledge Discovery Approach, Springer, 2007.
3. J. Han, M. Kamber, Data Mining: Concepts and Techniques, 2nd Edition, Morgan Kaufmann, 2006.
4. P. Tan, M. Steinbach, V. Kumar, Introduction to Data Mining, Addison Wesley, 2006.
5. D. Larose, Discovering Knowledge in Data. An Introduction to Data Mining, John Wiley & Sons, 2005.
6. Han, J., Kamber, M., Data Mining: Concepts and Techniques, 1st Edition, Morgan Kaufmann, 2000.
7. Weka system and documentation (http://www.cs.waikato.ac.nz/ml/weka/). Weka is a suite of machine learning / data mining software. It contains Java implementation for various mining algorithms, data preprocessing filters, and experimentation capabilities. Weka is free open-source software under the GNU General Public License (GPL).

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

- The course exists in the curriculum of many universities in the world.
- The results of course are considered by software and data mining companies particularly useful and topical, developing needed abilities in modelling and visualization of data.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Know concepts and methods from the domain of data mining and knowledge discovery	Research report and presentation	50%
10.5 Seminar/lab activities	Apply data mining techniques in real problems	Project implementation and presentation	50%

10.6 Minimum performance standards
Each student should be graded at least 5 for both assessments of course and seminar/lab activities. To obtain the minimum grade 5, the student must demonstrate the mastery of the basic concepts of data preparation to analyse them.

Date **Signature of course coordinator** **Signature of seminar coordinator**

10.07.2024 **Lect. Adriana Coroiu, PhD** **Lect. Adriana Coroiu, PhD**

Date of approval **Signature of the head of department**

16.07.2024 **Assoc. Prof. Beatrice Kelemen, PhD**