SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babeş Bolyai University
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	Bachelor
1.6 Study programme / Qualification	Artificial Intelligence

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)			Knowledge based systems				
2.2 Course coordinator			Lect. Univ. Dr. Găceanu Radu				
2.3 Seminar coordinator			Lect. Univ. Dr. Găceanu Radu				
2.4. Year of study	**3**	2.5 Semester	**5**	2.6. Type of evaluation	**E**	2.7 Type of discipline	**Compulsory**
2.8 Code of the discipline		MLE5201					

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

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					15
Additional documentation (in libraries, on electronic platforms, field documentation)					10
Preparation for seminars/labs, homework, papers, portfolios and essays					25
Tutorship					6
Evaluations					2
Other activities:					-

3.7 Total individual study hours	58
3.8 Total hours per semester	100
3.9 Number of ECTS credits	4

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	• Projector
5.2. for the seminar /lab activities	• Computers, specific development environment

6. Specific competencies acquired

Professional competencies	CE1.1 Description of artificial intelligence concepts and research directions CE1.2 Evaluation of the quality and stability of the obtained solutions and their comparison with the solutions obtained by traditional methods CE1.3 Using artificial intelligence methods, techniques and algorithms to model solutions to classes of problems
Transversal competencies	**CT1.** 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 **CT3.** 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 introduce the student in Knowledge-based systems (KBS)
7.2 Specific objective of the discipline	This course is aimed to advance both theoretical and practical aspects of KBS. The course aims to provide an overview of the discipline and its main areas. At the end of the course, students will understand the basic principles of KBS and associated algorithmic approaches and have knowledge of KBS applications.

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction to KBS 2. KBS a. Components b. Knowledge representation	• Interactive exposure • Presentation • Explanation	

▪ Formal logic ▪ Rules ▪ Semantic networks c. Inference process ▪ Techniques – certainty a. Logic b. Rule-based ▪ Techniques – uncertainty a. Probabilities b. Fuzzy 3. Logic-based KBS 4. KBS – certainty a. Design b. Architecture ▪ Knowledge base ▪ Inference a. Forward b. Backward c. Conflicts 5. KBS – uncertainty a. Architecture ▪ Knowledge base ▪ Inference a. Bayes b. Certainty theory c. Fuzzy logic – stages o Fuzzification o Rules o Fuzzy inference o Aggregation o Defuzzification o Results 6. Strengths and weaknesses of KBS 7. Real-world KBSs	• Practical examples • Case-study discussions	

Bibliography

1. S. Russell, P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 1995
2. C. Groşan, A. Abraham, Intelligent Systems: A Modern Approach, Springer, 2011
3. A. Hopgood, Intelligent Systems for Engineers and Scientists, CRC Press, 2001
4. H.F. Pop, G. Şerban, Inteligenţă artificială, Cluj Napoca, 2004
5. D. J. C. MacKey, Information Theory, Inference and Learning Algorithms, Cambridge University Press, 2003
6. G.J. Klir, B. Yuan, Fuzzy Sets and Fuzzy Logic, Prentice Hall, 1995

8.2 Seminar / laboratory	Teaching methods	Remarks
L1: Eficient solutions for algorithmic problems L2-L3: Design and implementation of KBS – certainty L4-L5: Design and implementation of KBS – uncertainty L6-L7: Recommendation systems	• Interactive exposure • Explanation • Conversation • Didactical demonstration	

Bibliography

1. S. Russell, P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 1995
2. C. Groşan, A. Abraham, Intelligent Systems: A Modern Approach, Springer, 2011
3. A. Hopgood, Intelligent Systems for Engineers and Scientists, CRC Press, 2001
4. G.J. Klir, B. Yuan, Fuzzy Sets and Fuzzy Logic, Prentice Hall, 1995

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 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 (%)
10.1 Course	Knowledge of the basic concepts of the field Applying the intelligent principles from the course content to solve complex and difficult problems	Final written report	10%
10.2 Seminar/lab activities	· Specification, design, implementation and testing of intelligent methods; problem solving; written reports and presentations	Observation of the student while solving the task Practical projects Written reports and presentations during the semester	90%
10.3 Minimum performance standards			
- Each student has to demonstrate that he has reached an acceptable level of knowledge and understanding of the field, that he is able to express the knowledge in a coherent form, that he has the ability to establish certain connections and to use the knowledge in solving some problems. - To pass the exam you must: - at least 60% of the assignments during the semester are completed - an evaluation average (written exam, seminar, laboratory) to be above 5			

Date	Signature of course coordinator	Signature of seminar coordinator
……	Lect. PhD. Găceanu Radu	Lect. PhD. Găceanu Radu

Date of approval

Signature of the head of department

.... Assoc. Prof. PhD. Sterca Adrian