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	**Computer Science**

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)	**Artificial Intelligence**						
2.2 Course coordinator	**Assistant Professor PhD Mihoc Tudor Dan**						
2.3 Seminar coordinator	**Assistant Professor PhD Mihoc Tudor Dan**						
2.4. Year of study	**2**	2.5 Semester	**4**	2.6. Type of evaluation	**E**	2.7 Type of discipline	**DS**
2.8 Code of the discipline	**MLE5029**						

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	**1 sem + 1 lab**
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	28
Additional documentation (in libraries, on electronic platforms, field documentation)	14
Preparation for seminars/labs, homework, papers, portfolios and essays	28
Tutorship	7
Evaluations	20
Other activities:	-

3.7 Total individual study hours	**94**
3.8 Total hours per semester	**150**
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1. curriculum	· Graph Theory, Data Structures and Algorithms
4.2. competencies	· Average programming skills in a high level programming language

5. Conditions (if necessary)

5.1. for the course	·
5.2. for the seminar /lab activities	· Laboratory with computers; high level programming language environment

6. Specific competencies acquired

Professional competencies	● **An introduction to the field of AI.** ● **Acquire the basic notion, techniques and algorithms of AI.** ● **The background for advanced AI courses.**
Transversal competencies	● **Ability to apply AI techniques to different real life problems** ● **Ability to model problems in an interdisciplinary field**

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

7.1 General objective of the discipline	· Ability to understand and use the basic AI algorithms and principles. · Ability to model real life problems as AI problems and find optimal solutions to them
7.2 Specific objective of the discipline	· Acquire the knowledge about the main classes of soft computing algorithms, the basic notions of game theory and knowledge base reasoning.

8. Content

8.1 Course	Teaching methods	Remarks
1. **Introduction to AI**	Exposure: description, explanation, examples, discussion of case studies	
2. **Problem solving as search** (Problem spaces, Uninformed search, Breadth first search, Depth first search, Limited depth first search, Iterative-deepening search, Uniform cost search)	Exposure: description, explanation, examples, discussion of case studies	
3. **Problem solving as search** (Informed search, Heuristic search, Best-first search, Greedy, A* algorithm, A* variants)	Exposure: description, explanation, debate, dialogue	
4. **Local search** (Simulated annealing, Hill climbing)	Exposure: description, explanation, examples, discussion of case studies	
5. **Evolutionary computation** (Evolutionary algorithms)	Exposure: description, explanation, examples, discussion of case studies	

6. **Swarm intelligence** (Particle swarm optimization, Ant Colonies optimization)	Exposure: description, explanation, examples, live demo	
7. **Game playing** (Minimax search, Alpha-beta pruning)	Exposure: description, explanation, examples, proofs	
8. **Knowledge representation and reasoning** (Knowledge based systems)	Exposure: description, explanation, examples, proofs, dialogues, debates	
9. **Rule based systems** (Uncertainty management in rule based systems)	Exposure: description, explanation, examples, discussion of case studies	
10. **Machine learning. Decision Trees**	Exposure: description, explanation, examples, discussion of case studies	
11. **Neural networks** (Single layer neural networks, Perceptron model)	Exposure: description, explanation, examples, discussion of case studies	
12. **Neural networks** (Multi-layer neural networks, Backpropagation learning)	Exposure: description, explanation, examples, discussion of case studies	
13. **Evolutionary Computation** (Evolutionary strategies, Evolutionary programming, Genetic programming)	Exposure: description, explanation, examples, discussion of case studies	
14. **Intelligent Systems** (Support Vector Machines, K-mean)	Exposure: description, explanation, examples, discussion of case studies	
Bibliography 1. GROSAN, C., Abraham, A., Intelligent Systems: a modern approach, Springer Verlag GERMANY, 2011 2. PATRIDGE, D., Artificial Intelligence. Applications in the future of software engineering, Ellis Harwood Series in A.I., John Wiley & Sons, New York 1986. 3. RICH, E. Artificial Intelligence, Mc.Graw Hill, 1989. 4. WINSTON, P., Inteligenta artificiala, Ed.Tehnica, 1980. GOLDBERG, D. E., Genetic Algorithm. Addison-Wesley, Reading, 1989		
8.2 Seminar	Teaching methods	Remarks
1. Uninformed Search	Explanation, dialogue, case studies, problem solving	The seminar is structured as 2 hours classes every second week
2. Informed Search	Explanation, dialogue, case studies, problem solving	
3. Evolutionary Algorithms	Dialogue, problem solving	
4. Swarm Intelligence	Dialogue, explanation, problem solving	
5. Games	Dialogue, debate, explanation	
6. Ruled based systems	Explanation, dialogue, problem solving	
7. Neural Networks	Explanation, dialogue, debate	
Bibliography:		

1. GROSAN, C., Abraham, A., Intelligent Systems: a modern approach, Springer Verlag GERMANY, 2011 2. RUSSELL, S., J., NORVIG, P., Artificial intelligence: A modern approach, N.J. Prentice Hall/Pearson Education, 2003		
8.3 Laboratory	Teaching methods	Remarks
1. Task: Implement an uninformed search algorithm, given from a list of projects	case studies, dialogues	The laboratory is structured as 2 hours classes every second week
2. Task: Implement an informed search algorithm, given from a list of projects	case studies, dialogues	
3. Task:Implement an Evolutionary Algorithm , given from a list of projects	case studies, dialogues	
4. Task:Implement a PSO and an ACO algorithm , given from a list of projects	case studies, dialogues	
5. Task: solve (implement and test) a game, given from a list of projects	case studies, dialogues	
6. Task: implement a rule based system, and apply it on a specific problem	case studies, dialogues	
7. Task: implement a Neural Network, and apply it on a specific problem	case studies, dialogues	
Bibliography: 1. GROSAN, C., Abraham, A., Intelligent Systems: a modern approach, Springer Verlag GERMANY, 2011 2. RUSSELL, S., J., NORVIG, P., Artificial intelligence: A modern approach, N.J. Prentice Hall/Pearson Education, 2003		

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 follows the scheme and structure used by the most important universities in USA and Europe;
- The course exists in the studying program of all major universities in Romania and abroad;

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	- know the basic principle of the AI domain; - apply the course concepts - problem solving	Written exam (there will be two written exams)	60%
10.5 Seminar/lab activities	- be able to implement the algorithm described in the course and discussed during the seminars	-Lab assignments	40%
10.6 Minimum performance standards			
➢ At least grade 5 (from a scale of 1 to 10) at both written exams and laboratory work			

Date	Signature of course coordinator	Signature of seminar coordinator
…….	Tudor - Dan Mihoc	Tudor - Dan Mihoc

Date of approval	Signature of the head of department
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