SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Computer science / Engineer
1.7 Form of education	Full time
1.8 Subject code	34.00

2. Data about the subject

2.1 Subject name			***Artificial intelligence***		
2.2 Course responsible / lecturer			Prof. dr. eng. Groza Adrian - Adrian.Groza@cs.utcluj.ro		
2.3 Teachers in charge of seminars / Laboratory / project			Prof. dr. eng. Groza Adrian - Adrian.Groza@cs.utcluj.ro Assoc. prof. dr. eng. Mărginean Anca - Anca.Marginean@cs.utcluj.ro		
2.4 Year of study	III	2.5 Semester	5	2.6 Type of assessment (E - exam, C - colloquium, V - verification)	E
2.7 Subject category	*DF – fundamentală, DD – în domeniu, DS – de specialitate, DC – complementară*				DD
	DI – Impusă, DOp – opțională, DFac – facultativă				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	4	Seminars		Laboratory	4	Project	
3.2 Number of hours per semester	56	of which:	Course	28	Seminars		Laboratory	28	Project	
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										20
(b) Supplementary study in the library, online and in the field										25
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										10
(d) Tutoring										5
(e) Exams and tests										9
(f) Other activities:										0

3.4 Total hours of individual study (suma (3.3(a)...3.3(f)))	69
3.5 Total hours per semester (3.2+3.4)	125
3.6 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	Logic Programming, Functional Programming
4.2 Competence	Elementary fundamentals of programming

5. Requirements (where appropriate)

5.1. For the course	Projector, Computer
5.2. For the applications	Computers with Linux, Specific Software

6. Specific competence

6.1 Professional competences	**C3 –** Problems solving using specific Computer Science and Computer Engineering tools (1 credit) • **C3.1 –** Identification of classes of problems and the methods to solve them characteristic of information systems • **C3.2 –** Usage of interdisciplinary knowledge, patterns of solutions and tools, experimentation and interpretation of their results • **C3.3 –** Aplication of solution patterns using engineering tools and methods • **C3.4 –** Comparative evaluation, including experiments, of alternative solutions, to optimize performance • **C3.5 –** Development and implementation of computational solutions for concrete problems **C5 –** Designing, managing the lifetime cycle, integrating and ensuring the integrity of hardware, software and communication systems (1 credit) • **C5.1 –** Stating the criteria relevant to quality, security and system interaction with the environment and human operator • **C5.2 –** Usage of interdisciplinary knowledge for the adaptation of the informatic system to the requirements of the application domain • **C5.3** – Using fundamental principles and methods for ensuring the security, the safety and ease of exploitation of the computing systems • **C5.4 –** Adequate utilization of quality, safety and security standards in information processing • **C5.5 –** Realization of a project including problem identification and analysis, design and development, while proving the understanding of the basic quality needs and requirements **C6 –** Designing intelligent systems (2 credits) • **C6.1 –** Describing the intelligent systems' components • **C6.2 –** Using domain-specific tools for explaining the operation of intelligent systems • **C6.3 –** Applying the main methods and principles for specifying solutions for typical problems using intelligent systems • **C6.4 –** Choosing criteria and methods for the evaluation of quality, performances and limitations of information systems • **C6.5 –** Developing and implementing professional projects for intelligent systems
6.2 Cross competences	N/A

7. Discipline objective (as results from the *key competences gained*)

7.1 General objective	Knowledge of representation and reasoning of fundamental problems of artificial intelligence
7.2 Specific objectives	Fundamental search methods, Usage of first-order logic and description logics, Basic planning representation and solving methods

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Introduction.	2	Slides, Algorithms, Quality of solutions, Exceptions, Limits in the representation of the real world, onsite	
Intelligent Agents: behavior, environments, structure .	2		
Solving Problems by Searching: uninformed, searching with partial information.	2		
Informed Search Methods and Exploration: heuristics, local search algorithms and optimization problems, local search in continuous spaces.	2		
Constraint Satisfaction Problems: backtracking, local search.	2		
Adversarial Search: alpha-beta pruning, imperfect, real-time decisions, games that include an element of chance.	2		

Logical Agents: knowledge-based agents, propositional logic, effective propositional inference.	2		
First-Order Logic: syntax and semantics, using first-order logic, knowledge engineering in first-order logic	2		
Inference in First-Order Logic: unification and lifting, forward chaining, backward chaining, resolution	2		
Planning: the planning problem, planning with state-space search, partial-order planning, planning graphs, planning with propositional logic	2		
Description Logics: basic notions in DLs, syntacs and semantics, basic reasoning problems, inverse roles, number restriction	2		
BDI Agents: goals, events, plans, triggering events, context, body, interpreter, features, scenarios	2		
Hierarchical Planning in BDI Agents: HTN planning, operational semantics, planning for declarative goals	2		
Debugging BDI Agent Programs	2		
Bibliography 1. Artificial Intelligence: A Modern Approach: Russell, Norvig, Prentice Hall, 2002 2. Basic Description Logics: Baader, Nutt, CUP, 2003			
8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Introduction to the documentation for the assignment	2	Platform, Documentation, Testing, Examples, New examples onsite	
Studying the documentation for the assignment	2		
Studying the design of the tool	2		
Practicing the exercises provided in the archive	2		
Understanding the main parts of the software	2		
Running the system by tracing at high level	2		
Mastering the running of the system and the examples provided	2		
Conceptual design of new examples	2		
Code for the new examples	2		
Testing and debugging the new cases	2		
Measuring the performance of the system	2		
Documenting the new scenarios	2		
Comparison of the differences between the cases developed and those provided	2		
Final evaluation of the exercises developed	2		
Bibliography Various Artificial Intelligence Tools from the WWW			

**Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.*

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The textbook is one of the most known and used one in the world of the best universities, continuously assessed by the university and research community in the world regarding its influence and use in the software oriented companies.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Problems and theoretical concepts	Written exam, onsite	75%
Seminar	-	-	-
Laboratory	Usage of specific tools on the examples developed and tested by the students	Evaluation in the laboratory onsite	25%
Project	-	-	-

Minimum standard of performance:
Representation of knowledge and its use in solving specific problems using specific tools
Grade calculus: 25% laboratory + 75% final exam
Conditions for participating in the final exam: Laboratory ≥ 5
Conditions for promotion: grade ≥ 5

Date of filling in: 03.06.2024	**Responsible**	**Title First name Last name**	**Signature**
	Course	Prof.dr.eng. Groza Adrian	
	Applications	Prof.dr.eng. Adrian Groza	
		Assoc.prof.dr.eng. Anca Mărginean	

Date of approval in the department
20.02.2024

Head of department,
Prof.dr.eng. Rodica Potolea

Date of approval in the Faculty Council
22.02.2024

Dean,
Prof.dr.eng. Mihaela Dînșoreanu