Course Name : Artificial Intelligence

Course Code	Course Type	Regular Semester	Lecture (hours/week)	Seminar (hours/week)	Lab. (hours/week)	Credits	ECTS
CMP 314	B	Spring	2.00	0.00	2.00	3.00	5.00

Lecturer	Edlir Spaho, MSc
Assistant	
Course language	Albanian
Course level	Bachelor
Description	The Artificial Intelligence course provides a general introduction to the basics of Artificial Intelligence. This course will cover the main techniques and methods of problem solving using AI by the use of logical reasoning agents, search methods, First-Order logic, logical reasoning systems, computational intelligence, artificial neural networks as well as genetic algorithms and programming.
Objectives	This course aims to: Familiarize students with research methods and techniques. Introduce students to the key concepts of Artificial Intelligence. Introduce students to the implementation of search algorithms. Enable students to learn the main methods and techniques used in Artificial Intelligence. Explain the importance and influence of Artificial Intelligence in designing intelligent applications and programs. Explain the integration of Artificial Intelligence concepts into Machine Learning. Develop students' critical thinking in analyzing the main methods and techniques used in Artificial Intelligence.
Core Concepts	Rational Agents, Informed Search, Uninformed Search, Heuristic functions, First-Order Logic, Forward & backward-chaining, Computational Intelligence, Neural Network, Fuzzy Logic, Genetic algorithm, Genetic programming, etc...

Course Outline

Week	Topic
1	Introduction to AI This topic will address what AI is, the disciplines that contributed to AI, the history of AI, and the evolution of artificial intelligence today. Lit1, (Pages 1-33)
2	Intelligent agents This topic will address agents and the environment, their perception, agent functions, agent programs, relational agent concept, omniscience, agent learning and autonomy, task environment definition, its features, agent structure, simple agents, model-based agents, goal-based agents, utility-based agents, learning agents and how the agent program component works. Lit1, (Pages 34-63)
3	Problem solving through research This topic will address agents that solve well-defined problems, problem examples, real-world problems. Search for solution, tree method, search algorithm infrastructure, problem-solving performance measurement, uninformed search strategies, breadth-first search, uniform-cost search, depth-first search, depth-limited search, bidirectional search, comparison of uninformed search strategies, informed (heuristic) search strategies, best-first search, optimality condition (Acceptability and consistency), memory-bounded search, heuristic functions. Lit1, (Pages 64-119)
4	Search Methods This topic will cover local search algorithm, hill-climbing search, local continuous space search, nondeterministic search, and-or search tree, partial preview search, online search agents, unknown environments, online search problems, online search agents and adversary search, games. Lit1, (Pages 120-201)
5	Agents who reason logically In this topic will be treated agents who reason based on knowledge, logic, propositional logic, proof of propositional theorem, control of the effective proposition model and agents based on propositional logic. Lit1, (Pages 234-284)

6	First-Order Logic (FOL) This topic will address the language of representation, the language of thought, the best combination of formal and natural languages, the syntax and semantics of FOL, the logic of the FOL model, the use of FOL logic, the engineering of knowledge in FOL. Lit1, (Pages 285-321)
7	Logical reasoning systems This topic will address propositional inference versus First-order, reduction in propositional inference, First-order infertility rule, Forward-chaining and backward-chaining algorithms. Lit1, (Pages 322-365)
8	Midterm Exam
9	Planning This topic will address the definition of classical planning, planning algorithms such as state-space search, planning graphs, other approaches to classical planning, their analysis, planning and action in the real world, timeframes and resources, hierarchical planning, planning and action in undefined areas, multiagent planning. Lit1, (Pages 366-436)
10	Computational Intelligence (CI) In this topic will be an introduction to the main problem classes for computational intelligence (CI) techniques, neural networks, fuzzy systems, evolutionary computing, Swarm intelligence. Lit2, (Pages 1-27)
11	Artificial Neural Networks with Matlab / Python This topic will address the history of neural networks, artificial neural networks, electronic implementation of artificial neuron, neural network components, neural network architecture and algorithm, layered architecture and predictive networks. Lit2, (Pages 29-106)
12	Evolutionary computation paradigms This topic will cover the history of evolutionary computation, the flowchart of a typical evolutionary algorithm, evolutionary computation models, genetic algorithm, genetic programming, evolutionary programming, evolutionary strategy, advantages and disadvantages of evolutionary computation. Lit2, (Pages 419-544)
13	Matlab / Python based genetic algorithm This topic will address the history, description and the role of genetic algorithm, its parameters, construction of block hypotheses, dynamism of a scheme, illustrations based on scheme theorem, cross operations, 1-point intersection, 2-point intersection and other operations in genetic algorithm. Lit 2, (Pages 547-588)
14	Genetic programming This topic will address the LISP programming language, genetic programming functionality, genetic programming functionalities, creating a random population, functions and terminals, genetic operations, selection functions, cross operations, genetic programming in machine language, basics of genetic programming, genetic programming flowchart and advantages of genetic programming. Lit 2, (Pages 591 -646)
15	General Review
16	Final Exam

Prerequisites	The student must attend the course at a minimum rate of 75%.
Literature	• Artificial Intelligence: A modern approach by S. Russel and P. Norvig, Fourth edition, 2021. • Computational intelligence paradigms, Theory and application using Matlab, S.Sumathi, Surekha P. CRC Press, 2010
References	• Tom Mitchell, Machine Learning

Course Outcome

1	Students will be able to understand what Artificial Intelligence is and how it evolves.
2	Students will have knowledge on the key concepts of Artificial Intelligence.
3	Students will have knowledge about main methods and techniques of problem solving through Artificial Intelligence.
4	Students will be able to implement key methods and techniques of problem solving through Artificial Intelligence by the use of Python.
5	Students will be ready to participate in fruitful discussions in the field of evolution of main methods and techniques used by Artificial Intelligence.
6	Students will be equipped with sufficient methods and techniques used by Artificial Intelligence to proceed with other subsequent courses.

Course Evaluation

In-term Studies	Quantity	Percentage
Midterms	1	30
Quizzes	0	0
Projects	1	30
Term Projects	0	0
Laboratory	0	0
Class Participation	0	0
Total in-term evaluation percent		**60**
Final exam percent		**40**
Total		**100**

ECTS Workload (Based on Student Workload)

Activities	Quantity	Duration (hours)	Total (hours)
Course duration (Including the exam week: 16x Total hours of the course)	16	4	64
Study hours outside the classroom (Preparation, Practice, etc.)	14	3	42
Duties	1	5	5
Midterms	1	6	6
Final Exam	1	8	8
Other	0	0	0
Total Work Load			**125**
Total Work Load / 25 (hours)			**5.00**
ECTS			**5.00**