UNIVERSITY of NICOSIA

Course Syllabus

Course Code COMP-549DL	**Course Title** Artificial Intelligence	**ECTS Credits** 10
Prerequisites None	**Department** Computer Science	**Semester** Spring
Type of Course Elective	**Field** Computer Science	**Language of Instruction** English
Level of Course 2nd Cycle	**Lecturer(s)** Prof. Athena Stassopoulou	**Year of Study** 1st or 2nd
Mode of Delivery Distance Learning	**Work Placement** N/A	**Corequisites** None

Course Objectives:

The course aims to provide a critical study of theory and research related to Artificial Intelligence. The course covers AI fundamental topic areas such as search, constraint satisfaction problems and knowledge representation and reasoning using logic as well as advanced topic areas on uncertain reasoning, probabilistic networks, certainty factors, Dempster-Shafer and Fuzzy Logic.

Learning Outcomes:

After completion of the course students are expected to be able to:

1. demonstrate an understanding of how to formulate problems in terms of a formal representation.
2. evaluate and apply various search techniques (both uniformed and informed) to solve problems.
3. develop suitable heuristic functions for informed search.
4. demonstrate an understanding of the fundamentals of game playing (both deterministic and stochastic games) and apply the suitable algorithms for searching and pruning game trees.

5. Formulate a problem as a constraint satisfaction problem, solve a simple problem using backtracking, applying variable and value ordering, forward checking and constraint propagation using node consistency, arc consistency and path consistency.
6. use predicate logic for knowledge representation and inference using forward chaining, backward chaining and resolution.
7. Know the various sources of uncertainty and the role of probability as a way to quantify uncertainty.
8. construct a Bayesian network to solve a simple problem and express the probability distributions of the model.
9. describe the propagation algorithm for performing inference in Bayesian Networks.
10. describe certainty factors, Dempster-Shafer and Fuzzy Logic approaches to uncertain reasoning and apply them to solve simple problems.

Course Content:

1. Introduction and Overview
2. Search: problem representation, uninformed search techniques, heuristic functions, heuristic search techniques
3. Adverserial search: game playing as search (deterministic, 2-player games), minimax algorithm, Alpha-beta pruning, searching a game tree for non-deterministic games, expectiminimax
4. Constraint Satisfaction: problem formulation as a constraint satisfaction problem, backtracking search, variable and value ordering, forward checking, constraint propagation.
5. Logic: Propositional Logic, Inference rules, First-Order (predicate) Logic and Inference in First-Order Logic.
6. Uncertain reasoning-Part I: Introduction to Bayesian Networks, Bayesian Updating (Bayes rule, inference, independence assumptions), Propagation in Polytrees,
7. Uncertain reasoning-Part II: Other approaches to reasoning with uncertainty, namely:certainty factors, Dempster-Shafer Theory of Evidence and Fuzzy Logic.

Learning Activities and Teaching Methods:

Lectures, Practical Exercises and Assignments

Assessment Methods:

Homework, Projects, On-line Quizzes, Final Exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Artificial Intelligence: A Modern Approach (3rd ed)	S. Russell and P. Norvig	Prentice Hall	2010	0132071487

Recommended Textbooks/Reading:

Title	Authors	Publisher	Year	ISBN
Artificial Intelligence: Structures and Strategies for Complex Problem Solving (6th ed).	G. F. Luger	Pearson	2009	0321545893
Probabilistic Graphical Models: Principles and Techniques	D. Koller and N. Friedman	MIT Press	2009	0262013193