AMERICAN UNIVERSITY
OF CYPRUS

Course Code	Course Name	ECTS Credit
MG362	Artificial Intelligence in computer games	7.5
Pre-Requisite	**Course Type**	**Language of Instruction**
CSC311	Major Elective	English
Year of Study	**Level of Course**	**Mode of Delivery**
4th/7th	BSc/1st Cycle	On Campus

Course Objectives:

The objective of the course is to understand in depth the use of artificial intelligence (different algorithms) in various computer games (e.g. chess, shooter games, arcade games etc). Emphasis will be placed on the underlying theory through practical applications and examples

Learning Outcomes

Upon successful completion of the course, students will be able to:

- Explain in a high-level various Artificial Intelligence algorithms (AI) used in different types of computer games.
- Describe the full architecture of an agent in a computer game.
- Understand how algorithms are applied to the basic moves of one or more players (e.g. running, hiding, orientation, tuning) in 2 and 3 dimensions.
- Understand how search algorithms are applied for an agent's objectives in order to achieve its objectives
- Understand and describe in more detail the way that an Al agent in a computer game makes decisions, applies tactics and strategies, 'understands' and learns
- Explain how Al is used in board games (e.g. chess,Go etc) with emphasis on modern developments using deep learning.

Teaching Methodology:

Lectures 42 hours

Labs 30 hours

Course Content:

Introductory of Artificial Intelligence in computer Games:

Brief introduction and summary historical review through examples:

Types of Artificial Intelligence Used in computer Games, Speed Issues, issues of Memory and Hardware and the Architecture of an Al Agent

Motion:

Movement in 2D and 3D, speed, application of simple Newtonian physics. Tracking algorithms, obstacle avoidance, etc. Algorithms for targeting and firing, multi-agent coordination algorithms in a group.

Pathfinding:

Use of weighted graphs, Dijkstra algorithms, A*, A* in hierarchical graphs and continuous time finding algorithms

Decision making:

Use of decision trees, utility functions, behavior trees, state machines, fuzzy logic and Markov process. Behavior based on goals and rules-based systems.

Tactics and Strategy:

Analysis of tactics, ground (world) analysis, modifications in tactical tracking algorithms based on tactics, learning through tactics, multilevel architecture of Al agent, military tactics and action coordination

Learning:

Online and offline Learning, action prediction, decision-making algorithms, Bayesian filters, decision trees reinforcement learning and artificial neural networks

Board games:

General definition, game tree, Minimaxing algorithm, AB pruning, transposition tables and memory issues, board data structures. Expert knowledge (e.g chess openings libraries). Modern developments, state of the art through the use of deep learning (alphazero chess & go)

Assessment Methods:

Final Exam

Mid-Term/Lab Exam

Assignments

Required Textbooks/Reading:

Title	Author(s)	Publisher	Year
Artificial Intelligence and Games, Springer	Yannakakis, Georgios N., J. Togelius		2018
Artificial Intelligence for Games	Ian Millington and John Funge	CRC Press	2009