National Computing Education Accreditation Council
NCEAC

Course Outlines

INSTITUTION   University of Management and Technology, Lahore

PROGRAM(S) TO   BS (Computer Science)
BE EVALUATED

Course Description

Course Code	*CS3151*
Course Title	*Artificial Intelligence*
Credit Hours	4 (3 + 1)
Prerequisites by Course(s) and Topics	Data Structures and Algorithms
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	Assignments: 15% Quizzes: 10% Midterm: 30% Final: 40% Class Participation: 5%
Resource Person	*Rana Marwat Hussain*
Contacts (Email)	marwat.hussain@umt.edu.pk
Office	CB 508 - (Cabin-3)
Counselling Hrs.	Thursday 09:00 AM – 12:00 PM
Course Moderator (if any)	
URL (if any)	
Current Catalog Description	Artificial Intelligence (AI) is the study that enables us to make machines behave somewhat like human beings, i.e., they are able to perceive new stimuli from their environments, and are able to make intelligent decisions that lead to rational actions by them. In this course, we first try to create an interest in this field within students, and try to show how this field has roots from various branches of knowledge such as psychology, philosophy, economics, math, and many others. We try to develop an understanding of basic search techniques, both uninformed and informed (heuristic based) search techniques. We then try to introduce students to basic concepts related to games and adversarial search (mostly related to deterministic games). After that we build on concepts related to constraint satisfaction, using examples like map coloring to explain the basic concepts. We then move onto first order logic, then decision trees for classification and concepts related to machine learning.
Teaching Methodology	Lectures, Assignments, labs, Projects, Presentations, etc. Major component of the course should be covered using conventional lectures.
Textbook (or **Laboratory Manual** for Laboratory Courses)	"*Artificial Intelligence, A Modern Approach*" by Stuart Russell and Peter Norivg, 4th or 3rd edition.

Reference Material	*Pattern classification,* by Hart, P.E., Stork, D.G. and Duda, R.O., 2001. John Willey & Sons.
Course Objectives	• To appreciate the origins of the field of AI, along with some major milestones in this field of AI over the years. • To understand the basics of informed and uninformed search strategies, and why sometimes there is a tradeoff between memory requirements and performance. • To understand basic constraint satisfaction problems, and how to solve them. • To provide an initial understanding of fields such as classification and regression, first order logic and machine learning.

Course Learning Outcomes (CLOs):

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

Course Learning Outcomes (CLOs)	Domain	BT Level
1. **Understand** the key components in the field of artificial intelligence	C	2
2. **Implement** classical artificial intelligence techniques	C	3
3. **Analyze** artificial intelligence techniques for practical problem solving	C	4

Mapping of CLOs to Program Learning Outcomes (PLOs)

CLOs / PLOs	CLO1	CLO2	CLO3
PLO1: Academic Education			
PLO2: Knowledge for Solving Computing Problems	✓	✓	
PLO3: Problem Analysis			✓
PLO4: Design/ Development of Solutions			
PLO5: Modern Tool Usage			
PLO6: Individual and Team Work			
PLO7: Communication			
PLO8: Computing Professionalism and Society			
PLO9: Ethics			
PLO10: Life-long Learning			

Week-by-week lecture plan with course topics

Week	Topics Covered	Chapter No.	Corresponding CLOs (#)

1.	• Introduction to course • Foundations of AI, applications and history	Chapter 1	CLO1
2.	• Agents, Intelligent agents, Rationality, PEAS • Environment Types, Types of Agents.	Chapter 2	CLO1
3.	• Problem solving agents. Vacuum cleaner world, single-state problem. • 8-puzzle, 8-queen problem, tree search example.	Chapter 3	CLO2
4.	• Uninformed search strategies: BFS and UCS • Uninformed search strategies: UCS, DFS, DLS and IDS.		CLO2
5.	• Uninformed search strategies: time/space complexity.		
	• Informed search strategies: Greedy best-first search.		
6.	• Informed search strategies: A* - properties of A* • Admissible heuristics, optimality of A*, Dominance.		CLO2
7.	• Local search algorithms, Iterative improvement algorithms and Hill climbing • Simulated annealing, local beam & stochastic beam search	Chapter 4	
8.	• Genetic algorithms – Steps with example.		
9.	• Constraint satisfaction problems. Map coloring. • Backtracking: MRV, Degree Heuristic, LCV, forward checking. • Arc consistency (constraint propagation). AC-3 algorithm.	Chapter 6	CLO3
10.	• Adversarial search, types of games. • Minimax algorithm. • Multiplayer games, Alpha-beta pruning. • Resource limitations; non-deterministic games	Chapter 5	CLO2
11.	• Logical agents: Knowledge-based agents • Logical agents: Wumpus world. • Modus tollens/ponens, • Satisfiability, forward/back chaining.	Chapter 7	CLO1
12.	• Introduction to Machine Learning • Need and types of Learning	Chapter 19	CLO1
13.	• Supervised Learning – Classification • Supervised Learning - Regression		CLO3
14.	• Neural Networks basic concepts	Chapter 20	CLO1
15.	• Any other advance Topics in AI (NLP, Digital Image Processing, Computer Vision etc) • *Revision of the course*	Chapter 23, 25	CLO1

Mapping of CLOs to Direct Assessments

CLOs▼	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Assignment 1	Assignment 2	Midterm Exam	Project	Final Exam
1	✓	✓			✓	✓	✓	✓	✓
2		✓	✓	✓	✓	✓	✓	✓	✓
3				✓				✓	✓