20MCA188	ARTIFICIAL INTELLIGENCE	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course introduces the techniques of Artificial Intelligence and analyzes various methods of solving problems using it. The concept of expert system architecture & fuzzy operations are introduced. This course serves as a prerequisite for many advanced courses in Data Science areas.

Prerequisite: Mathematical Foundations for Computing, Advanced Data structures

Course Outcomes: After the completion of the course the student will be able to

CO 1	Apply the steps needed to provide a formal specification for solving the problem.
CO 2	Apply and analyze the different types of control and heuristic search methods to solve problems
CO 3	Understand various Game theory problems& Knowledge structures
CO 4	Formulate knowledge representation and examine resolution in predicate and propositional logic
CO 5	Apply feasible planning and learning techniques to solve non-trial problems
CO 6	Analyze expert systems & fuzzy operations to solve real life problems.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3							2			
CO 2	3	3							2			
CO 3	3	3							2			
CO 4	3	3							2			
CO 5	3	3							2			
CO 6	3	3	3				3		2		2	2

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	**2**	
Remember(K1)	10	10	10
Understand(K2)	20	20	20
Apply(K3)	20	20	30
Analyse(K4)			
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance   : 8 marks
Continuous Assessment Test (2 numbers)   : 20 marks
Assignment/Quiz/Course project   : 12 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question caries 3 marks. Part B contains 2 questions from each module of which student should answer any one.Each question can have maximum 2 sub-divisions and carry 6 marks

Course Level Assessment Questions

 Course Outcome 1 (CO1):

1. Describe the areas of Artificial intelligence. (K1)

2. List the problem formulations & production characteristics. (K1 & K2)

3. Solve the various problems such as 8 puzzle, Crypt arithmeticetc(K3)

Course Outcome 2 (CO2):

1. Describe search strategies in solving problems. (K1 & K2)

2. List the disadvantages of hill climbing algorithm (K1& K2)

3. Illustrate A* algorithm for the graph (K3)

Course Outcome 3 (CO3):

1. Demonstrate two player Zero sum game (K3)

2. List and explain the knowledge representation methods in AI.   (K1&K2)

3. Explain how alpha-beta algorithm works in pruning of branches with an example.(K3)

Course Outcome 4 (CO4):

1. Translate the following sentence to predicate logic   (K3)

     a) 'All pompeians were Roman'

     b)'All Romans were either loyal to Caesar or hated him'.

2. Explain the algorithm to convert WFF to clause.(K1 & K2)

3.Describe about resolution graph in predicate and propositional logic.(K1 & K2)

Course Outcome 5 (CO5):

1. Differentiate between Goal stack and Hierarchical planning in AI. (K1 & K2)

2. Discuss about neural net learning(K1 & K2)

3. List out the steps in genetic learning. (K1 & K2)

Course Outcome 6 (CO6):

1. Specify the components in expert system. (K1 & K2)

2. Solve various fuzzy operations   (K3)

3. List out & explain various tools and languages in AI. (K1 & K2)

Model question paper

Part A

1. List the applications areas in AI
2. Solve the following cryptarithmetic problem

   SEND +
   MORE
   MONEY

3. Explain iterative deepening search
4. List the disadvantages of hill climbing
5. Solve a simple two player Zero sum game
6. Explain about conceptual dependency
7. Explain inference rules in FOPL
8. List components of a planning system
9. Give a short note on role of an expert system
10. List various fuzzy operations

(10X3=30 marks)

Part B

11. Consider a water jug problem .You are given two jugs, a 4 gallon and 3 gallons. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into 4-gallon jug.State the production rule for waterjug problem

    (6)

OR

12. Solve missionaries and cannibals problem (6)
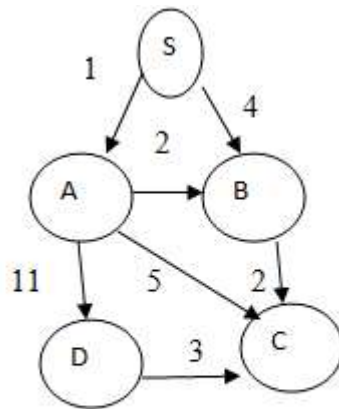

13. Explain blind search strategies in detail (6)

OR

14. Explain A* Algorithm for the given graph (6)

Heuristic Value:

S	6
A	2
B	3
C	0
D	5

15. List and explain the knowledge representation methods in AI. (6)

OR

16. Explain how alpha-beta algorithm works in pruning of branches with an example. (6)

17. Explain the algorithm to convert WFF to clause with an example. (6)

OR

18. Explain Neural net and Genetic learning methods in AI (6)

19. Illustrate architecture of an expert system and mention its features. (6)

OR

20. Solve the following using various Fuzzy set operations (6)
    A= {0.1/1,0.3/2,0.45/3}

    B={0.15/1,0.34/2}

(5X6=30 Marks)

SYLLABUS

Module 1

Introduction to AI and Production Systems:- AI-Problem formulation, Problem Definition - Production systems, Problem characteristics, Production system characteristics , Example AI Problems (8 Puzzle problem, Missionary Cannibals Problem, Crypt arithmetic Problems, block world Problem)

Module 2

Search Strategies : - Blind search strategies -Depth First Search, Breadth First Search, Best First Search, Iterative Deepening Search, Heuristic Search strategies- Admissible Heuristics and examples - Simple Hill Climbing and Steepest Ascending Hill Climbing, Simulated Annealing , A* algorithm.

Module 3

Game playing : Two Player Zero Sum Games, Modelling Two Player Zero Sum Games as search problems, Min-Max Algorithm, Optimizing Min Max Algorithm using $\alpha - \beta$ cut off, *Knowledge Representation Structures :* Frames, Sematic Networks and Conceptual Dependencies.

Module 4

Knowledge representation using Logic : - First Order Predicate Logic (FOPL), Well Formed Formula(WFF) in FOPL, Inference rules for FOPL, The Clause Form and conversion of WFFs to Clause Form, Resolution- Refutation .*Planning :*- Overview, components of a planning system, Goal stack planning, Hierarchical planning, *Learning :*-Forms of learning, neural net learning & genetic learning

Module 5

Expert systems:–Architecture of expert systems, Roles of expertsystems,Languages and tools – Typical expert system examples.*Fuzzy Logic:* - Fuzzy Variables ,Fuzzy Sets and Fuzzy Set Operations, Typical Examples using FuzzySets.

Text Books

1. Kevin Night and Elaine Rich, "*Artificial Intelligence (SIE)*", McGrawHill-2008.
2. StuartRussel and Peter Norvig "*AI – A Modern Approach*", 2nd Edition, Pearson Education2007.

Reference Books

1.Peter Jackson, "*Introduction to Expert Systems*", 3rd Edition, Pearson Education,2007.
2.Dan W. Patterson, "*Introduction to AI and ES*", Pearson Education,2007.

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	*Module I: Introduction to AI*	*9 hrs*
1.1	AI-Problem formulation, Problem Definition -Production systems	
1.2	Production system characteristics	
1.3	AI Problems	
2	*Module II: Search Strategies*	*9 hrs*
2.1	Blind search strategies	
2.2	Heuristics search strategies	
2.3	Simple Hill Climbing and Steepest Ascending Hill Climbing,	
2.4	Simulated anneling	
2.5	A* algorithm	
3	*Module III: Game playing*	*9 hrs*
3.1	Zero sum game	
3.2	Minimax algorithm	
3.3	Alpha beta pruning	
3.4	Knowledge representation structure	
4	*Module IV: Knowledge representation using Logic*	*12 hrs*
4.1	First Order Predicate Logic (FOPL)	
4.2	Well Formed Formula(WFF) in FOPL, Inference rules for FOPL	
4.3	The Clause Form and conversion of WFFs to Clause Form	
4.4	Resolution	
4.5	Planning	
4.6	Learning	
5	*Module V: APPLICATIONS*	*6 hrs*
5.1	Expert system Architecture	
5.2	Fuzzy logic operations	
5.3	Languages and tools	