## SEMESTER S5

# ARTIFICIAL INTELLIGENCE

| Course Code | PECST522 | CIE Marks | 40 |
|---|---|---|---|
| Teaching Hours/Week (L: T:P: R) | 3:0:0:0 | ESE Marks | 60 |
| Credits | 3 | Exam Hours | 2 Hrs. 30 Min. |
| Prerequisites (if any) | None | Course Type | Theory |

**Course Objectives:**

1. To lay a solid foundation of the important abstractions, techniques, and reasoning for intelligent systems.
2. To enable the learners to understand the basic principles of Reinforcement Learning.

## SYLLABUS

| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | **Introduction to Artificial Intelligence:-**<br>Introduction, Foundation and history of AI Agents and Environments; The concept of rationality; The nature of environments, Structure of agents.<br>Problem solving Agents Well-defined problems and solutions, Formulating problems; Example problems- vacuum world, 8-puzzle, 8-queens. | 8 |
| 2 | **Searching:-**<br>Depth First Search, Breadth First Search, Iterative Deepening Search. Heuristic Search strategies - Heuristic functions, The effect of heuristic accuracy on performance; Generate and test, Greedy best first search, A* algorithm, Constraint satisfaction problems, Adversarial search - Games, Optimal Decision in games, The minimax algorithm, Alpha–beta pruning. | 10 |
| 3 | **Knowledge-Based Agents** :-<br>The Wumpus World, Logic, Propositional Logic, Reasoning Patterns in Propositional Logic, First order logic, Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining. | 8 |

| | | |
|---|---|---|
| **4** | **Reinforcement Learning :-** Learning from Rewards, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Apprenticeship and Inverse Reinforcement Learning, Applications of Reinforcement Learning | **10** |

**Course Assessment Method**

**(CIE: 40 marks, ESE: 60 marks)**

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (Written ) | Total |
|---|---|---|---|---|
| **5** | **15** | **10** | **10** | **40** |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br><br>**(8x3 =24 marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 subdivisions.<br>**(4x9 = 36 marks)** | **60** |

## Course Outcomes (COs)

At the end of the course students should be able to:

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Explain how intelligent agents can solve problems. | **K2** |
| **CO2** | Use the different types of search methods to solve various problems. | **K3** |
| **CO3** | Formulate knowledge representation and examine resolution in propositional logic and first order logic. | **K3** |
| **CO4** | Utilize reinforcement learning techniques to create intelligent agents. | **K3** |

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

## CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 |
| **CO2** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 |
| **CO3** | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 |
| **CO4** | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 |

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | AI – A Modern Approach | Stuart Russel, Peter Norvig | Pearson Education | 4/e, 2021 |
| 2 | Artificial Intelligence | Kevin Knight, Elaine Rich, Shivashankar B. Nair | Tata McGraw-Hill | 3/e, 2009 |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | Introduction to Artificial Intelligence and Expert Systems | Dan W. Patterson | Pearson Education | 1/e, 2015 |
| 2 | Artificial Intelligence: Structures and Strategies for Complex Problem Solving | George F. Luger | Pearson Education | 6/e, 2009 |
| 3 | Artificial Intelligence : Making a System Intelligent | Nilakshi Jain | Wiley | 1/e, 2019 |

| Video Links (NPTEL, SWAYAM…) | |
|---|---|
| **Module No.** | **Link ID** |
| 1 | https://www.youtube.com/watch?v=X_Qt0U66aH0 |
| 2 | https://www.youtube.com/watch?v=te1K8on1Pk0 |
| 3 | https://www.youtube.com/watch?v=SEJhMO1IXZs |
| 4 | https://youtu.be/YaPSPu7K9S0?si=DizMPlZ9uVSy50iG |