| Course Code | 18CSC305J | Course Name | ARTIFICIAL INTELLIGENCE | | Course Category | C | Professional Core | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 3 | 0 | 2 | 4 |

| Pre-requisite Courses | Nil | Co-requisite Courses | Nil | Progressive Courses | Nil |
|---|---|---|---|---|---|
| Course Offering Department | | Computer Science and Engineering | Data Book / Codes/Standards | Nil | |

**Course Learning Rationale (CLR):** *The purpose of learning this course is to:*

| | | Learning | | | Program Learning Outcomes (PLO) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

CLR-1 : *Provide a broad understanding of the basic techniques for building intelligent computer systems and an understanding of how AI is applied to problems.*
CLR-2 : *Gain knowledge in problem formulation and building intelligent agents*
CLR-3 : *Understand the search technique procedures applied to real world problems*
CLR-4 : *Understand the types of logic and knowledge representation schemes*
CLR-5 : *Acquire knowledge in planning and learning algorithms*
CLR-6 : *Gain knowledge in AI Applications and advances in Artificial Intelligence*

**Course Learning Outcomes (CLO):** *At the end of this course, learners will be able to:*

Learning columns: 1 = Level of Thinking (Bloom), 2 = Expected Proficiency(%), 3 = Expected Attainment(%)

PLO columns: 1 = Engineering Knowledge, 2 = Problem Analysis, 3 = Design & Development, 4 = Analysis, Design, Research, 5 = Modern Tool Usage, 6 = Society & Culture, 7 = Environment & Sustainability, 8 = Ethics, 9 = Individual & TeamWork, 10 = Communication, 11 = Project Mgt.&Finance, 12 = LifeLongLearning, 13 = PSO-1, 14 = PSO-2, 15 = PSO-3

| CLO | Outcome | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLO-1 : | Formulate a problem and build intelligent agents | 1 | 80 | 70 | M | M | M | M | H | - | - | - | M | L | - | H | L | L | L |
| CLO-2 : | Apply appropriate searching techniques to solve a real world problem | 2 | 85 | 75 | M | H | H | H | H | - | - | - | M | L | - | H | M | L | M- |
| CLO-3 : | Analyze the problem and infer new knowledge using suitable knowledge representation schemes | 2 | 75 | 70 | M | H | H | H | H | - | - | - | M | L | - | H | M | L | M |
| CLO-4 : | Develop planning and apply learning algorithms on real world problems | 2 | 85 | 80 | M | H | M | H | H | - | - | - | M | L | - | H | M | M | M |
| CLO-5 : | Design an expert system and implement natural language processing techniques | 3 | 85 | 75 | M | H | H | H | H | - | - | - | M | L | - | H | H | M | H |
| CLO-6 : | Implement advance techniques in Artificial Intelligence | 3 | 80 | 70 | L | H | M | M | H | - | - | - | H | L | - | H | H | M | H |

| Duration (hour) | | 15 | 15 | 15 | 15 | 15 |
|---|---|---|---|---|---|---|
| S-1 | SLO-1 | Introduction to AI-AI techniques | Searching techniques- Uniformed search- General search Algorithm | Knowledge and reasoning-Approaches and issues of knowledge reasoning | Planning- Planning problems, Simple planning agent | Expert system-Architecture |
| | SLO-2 | Problem solving with AI | Uniformed search Methods-Breadth first search | Knowledge base agents-Logic Basics | Planning languages | Pros and Cons of expert system |
| S-2 | SLO-1 | AI Models, Data acquisition and learning aspects in AI | Uniformed search Methods-Depth first search | Logic-Propositional logic-syntax ,semantics and inferences | Blocks world ,Goal stack planning | Rule based systems |
| | SLO-2 | Problem solving- Problem solving process, Formulating problems | Uniformed search Methods-Depth limited search | Propositional logic- Reasoning patterns | Mean Ends Analysis | Frame based expert system |
| S-3 | SLO-1 | Problem types and characteristics | Uniformed search Methods- Iterative Deepening search | Predicate logic – Syntax and semantics, instance and is relationship | Non-linear Planning | Case study |
| | SLO-2 | Problem space and search | Bi-directional search | Unification and Resolution | Conditional planning, Reactive planning | Case study |
| S 4-5 | SLO-1 | Lab 1: Implementation of toy problems | Lab4: Implementation and Analysis of DFS and BFS for an application | Lab 7: Implementation of unification and resolution for real world problems. | Lab 10 :Implementation of block world problem | Natural language processing-Levels of NLP |
| | SLO-2 | | | | | |
| S-6 | SLO-1 | Intelligent agent | Informed search- Generate and test, Best First search | Knowledge representation using rules | Learning- Machine learning | Syntactic and Semantic Analysis |
| | SLO-2 | Rationality and Rational agent with performance measures | Informed search-A* Algorithm | Knowledge representation using semantic nets | Goals and Challenges of machine learning | Information retrieval |
| S-7 | SLO-1 | Flexibility and Intelligent agents | AO* research | Knowledge representation using frames | Learning concepts, models | Information Extraction |

| | | | | | |
|---|---|---|---|---|---|
| | SLO-2 | Task environment and its properties | Local search Algorithms-Hill Climbing, Simulated Annealing | Inferences | Artificial neural network based learning- Back propagation | Machine translation |
| S-8 | SLO-1 | Types of agents | Local Beam Search | Uncertain Knowledge and reasoning-Methods | Support vector machines | NLP Applications |
| | SLO-2 | Other aspects of agents | Genetic Algorithms | Bayesian probability and belief network | Reinforcement learning | NLP Applications |
| S 9-10 | SLO-1 SLO-2 | Lab 2: Developing agent programs for real world problems | Lab 5: Developing Best first search and A* Algorithm for real world problems | Lab 8: Implementation of knowledge representation schemes - use cases | Lab 11: Implementation of learning algorithms for an application | Lab 14:Implementation of NLP programs |
| S-11 | SLO-1 | Constraint satisfaction problems(CSP) | Adversarial search Methods-Game playing-Important concepts | Probabilistic reasoning | Adaptive learning | Advance topics in Artificial Intelligence-Cloud Computing and intelligent agent |
| | SLO-2 | Crypto arithmetic puzzles | Game playing and knowledge structure | Probabilistic reasoning over time | Multi_agent based learning | Business intelligence and analytics |
| S-12 | SLO-1 | CSP as a search problem-constrains and representation | Game as a search problem-Minimax approach | Forward and backward reasoning | Ensemble learning | Sentiment Analysis |
| | SLO-2 | CSP-Backtracking, Role of heuristic | Minimax Algorithm | Other uncertain techniques-Data mining | Learning for decision making | Deep learning Algorithms |
| S-13 | SLO-1 | CSP-Forward checking and constraint propagation | Alpha beta pruning | Fuzzy logic | Distributed learning | Deep learning Algorithms |
| | SLO-2 | CSP-Intelligent backtracking | Game theory problems | Dempster -shafer theory | Speedup learning | Planning and logic in intelligent agents |
| S 14-15 | SLO-1 SLO-2 | Lab 3: Implementation of constraint satisfaction problems | Lab 6: Implementation of minimax algorithm for an application | Lab 9: Implementation of uncertain methods for an application | Lab12: Development of ensemble model for an application | Lab 15: Applying deep learning methods to solve an application. |

**Learning Resources**

1. Parag Kulkarni, Prachi Joshi, Artificial Intelligence –Building Intelliegent Systems, 1st ed., PHI learning,2015
2. Deepak Kemhani, First course in Artificila Intelligence, McGraw Hill Pvt Ltd, 2013
3. Stuart J. Russell, Peter Norwig , Artificial Intelligence –A Modern approach, 3rd Pearson Education, 2016
4. Prateek Joshi, Artificial Intelligence with Phython, 1st ed.,Packt Publishing,2017
5. Denis Rothman, Artificial Intelligence by Example, Packt, 2018

**Learning Assessment**

| | Bloom's Level of Thinking | Continuous Learning Assessment (50% weightage) | | | | | | | | Final Examination (50% weightage) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLA – 1 (10%) | | CLA – 2 (15%) | | CLA – 3 (15%) | | CLA – 4 (10%)# | | | |
| | | Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice |
| Level 1 | Remember Understand | 20% | 20% | 10% | 10% | 15% | 15% | 15% | 15% | 15% | 15% |
| Level 2 | Apply Analyze | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% |
| Level 3 | Evaluate Create | 10% | 10% | 20% | 20% | 15% | 15% | 15% | 15% | 15% | 15% |
| | Total | 100 % | | 100 % | | 100 % | | 100 % | | - | |

# CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

**Course Designers**

| Experts from Industry | Experts from Higher Technical Institutions | Internal Experts |
|---|---|---|
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| 2. | 2. | 2. Dr.G..Vadivu, SRMIST |
| | 3. | 3. Dr.C.Lakshmi, SRMIST |