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

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|----------------------------|----------------------------------|----------------------|-----|-----------------------------|-----|
| 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: | | |
|----------------------------------|--|--|--|--|
| 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: | | |
|---------------------------------|---|--|--|--|
| CLO-1 : | Formulate a problem and build intelligent agents | | | |
| CLO-2 : | Apply appropriate searching techniques to solve a real world problem | | | |
| CLO-3 : | Analyze the problem and infer new knowledge using suitable knowledge representation schemes | | | |
| CLO-4 : | Develop planning and apply learning algorithms on real world problems | | | |
| CLO-5 : | Design an expert system and implement natural language processing techniques | | | |
| CLO-6 : | Implement advance techniques in Artificial Intelligence | | | |

| Learning | | |
|---------------------------|--------------------------|-------------------------|
| 1 | 2 | 3 |
| Level of Thinking (Bloom) | Expected Proficiency (%) | Expected Attainment (%) |
| 1 | 80 | 70 |
| 2 | 85 | 75 |
| 2 | 75 | 70 |
| 2 | 85 | 80 |
| 3 | 85 | 75 |
| 3 | 80 | 70 |

| Program Learning Outcomes (PLO) | | | | | | | | | | | | | | |
|---------------------------------|------------------|----------------------|----------------------------|-------------------|-------------------|------------------------------|--------|------------------------|---------------|------------------------|--------------------|--------|--------|---------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Engineering Knowledge | Problem Analysis | Design & Development | Analysis, Design, Research | Modern Tool Usage | Society & Culture | Environment & Sustainability | Ethics | Individual & Team Work | Communication | Project Mgt. & Finance | Life Long Learning | PSO -1 | PSO -2 | PSO - 3 |
| M | M | M | M | H | - | - | - | M | L | - | H | L | L | L |
| M | H | H | H | H | - | - | - | M | L | - | H | M | L | M |
| M | H | M | M | H | - | - | - | M | L | - | H | M | L | M |
| M | H | M | H | H | - | - | - | M | L | - | H | M | M | M |
| M | H | H | H | H | - | - | - | M | L | - | H | H | M | H |
| 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 | 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 |
| | SLO-2 | 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 |
| S-11 | SLO-1 | | | | | |
| | 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-constraints 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 | 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. |
| | SLO-2 | | | | | |

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

| 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 | 20% | 20% | 10% | 10% | 15% | 15% | 15% | 15% | 15% | 15% |
| | Understand | | | | | | | | | | |
| Level 2 | Apply | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% |
| | Analyze | | | | | | | | | | |
| Level 3 | Evaluate | 10% | 10% | 20% | 20% | 15% | 15% | 15% | 15% | 15% | 15% |
| | Create | | | | | | | | | | |
| | 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 |
| 1. Mr. Jagatheeswaran, Lead, Auxo labs jagatheeswarans.iot@auxolabs.in | | 1. Dr. Chitrakala, Anna University, au.chitras@gmail.com |
| 2. | | 2. |
| | | 3. |
| | | Internal Experts |
| | | 1. Dr.M.Pushpalatha, SRMIST |
| | | 2. Dr.G..Vadivu, SRMIST |
| | | 3. Dr.C.Lakshmi, SRMIST |