

|             |           |             |                         |                 |   |                   |   |   |   |   |
|-------------|-----------|-------------|-------------------------|-----------------|---|-------------------|---|---|---|---|
| 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: |  |  |
|----------------------------------|--|--|--|--|
| 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                | H                    | 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 |   |  |   |  |  |

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