|  |  |  |
| --- | --- | --- |
| IQRA University (IU) | | |
| Faculty of Engineering Sciences and Technology (FEST) | | |
| Computer Science Department (CS) | | |
| Course Code | Course Name | Credit Hr |
| AIN371 | ARTIFICIAL INTELLIGENCE | 3+1 |

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Basic Information | | | |
| Instructor | Dr Razia Maroof | Designation | Assistant Professor |
| Prerequisite(s) | Software Engineering | Semester | Fall 2024 |
| Email | [razia.maroof@iqra.edu.pk](mailto:razia.maroof@iqra.edu.pk) | Phone |  |
| Consulting Hours | 9:00 till 5:00 | Office Location | First Floor Faculty offices |

|  |
| --- |
| 1. **Course Objective(s)** |
| Artificial Intelligence has emerged as one of the most significant and promising areas of computing. This course focuses on the foundations of AI and its basic techniques like Symbolic manipulations, Pattern Matching, Knowledge Representation, Decision Making and Appreciating the differences between Knowledge, Data and Code. Python has been proposed for the practical work of this course. |

|  |
| --- |
| 1. **Course Contents** |
| Introduction to AI, Intelligence and Artificial Intelligence, branches and applications. Agent based Systems: Introduction, applications, rationality, environment types, and agent types. Problem Solving, formulating problems. Uninformed search strategies, Breadth-first search, uniform search, depth first search, iterative depending search. Performance parameters. Informed (Heuristic) Search Strategies, Heuristic functions, greedy search, A\* Search, Genetic algorithm. Game Playing, minmax algorithm, Alpha Beta Pruning. Knowledge and reasoning, Introduction to Fuzzy Logic, operator, inference procedure. Advanced Topics, Machine Learning, Types of machine learning, artificial neural network, Naïve Bayes etc. Natural Language Processing; Recent trends in AI and applications of AI algorithms. Any programming language will be used to explore and illustrate various issues and techniques in Artificial Intelligence. |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1. **Course Learning Outcomes** | | | | | | |
| **CLOs** | **CLO Statement** | **BT Level** | **Mapping** | | | **% Weight** |
| **GAs** | **ACM KA** | **SGDs** |
| CLO1 | **Explain** key concepts in the field of artificial intelligence | C2 | GA2 | #14  FPL | 9 | N.A |
| CLO2 | **Apply** appropriate algorithms and AI techniques to solve complex problems | C3 | GA5 | N.A |
| CLO3 | **Design** and implement basic AI algorithms, and test their effectiveness on real-world problems. | C6 | GA4 | N.A |
| ***Note: On successful completion of course GA 1 (Academic Education) will automatically attain.*** | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Textbook / Reference Books and Supplementary Reading Material** | | | |
| **S No** | **Book Title** | **Author(s)** | **Edition/ publication year/publisher** |
|  | Artificial Intelligence: A Modern Approach | Stuart Russell and Peter Norvig | 4th Edition |
|  | Artificial Intelligence: Foundations of Computational Agents | David L. Poole and Alan K. Mackworth | 3rd Edition |
|  | Fuzzy Logic with Engineering Applications | Timothy J. Ross, | 4th Edition, John Wiley & Sons, Ltd, 2016 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1. **CLO Outcome Based Assessment (OBA) Tentative** | | | | | | |
| **Assessment Tool** | | **CLO Mapped** | **CLO Marks** | **% Weight** | **Total Marks** | **Assessment Date** |
| **Quizzes**  **10** | Quiz #1 | *CLO1* | 10 | 30% | 3 | TBD |
| Quiz #2 | *CLO2* | 10 | 30% | 3 |  |
| Quiz #3 | *CLO3* | 10 | 40% | 4 |  |
| **Total Quizzes %** | | | **100%** | 10 |  |
|  | | | | | | |
| **Assignments**  **15** | Assignment #1 | *CLO1* | 3 | 33.3% | 5 |  |
| Assignment #2 | *CLO2* | 3 | 33.3% | 5 |  |
| Assignment #3 | **CLO3** | 4 | 33.3% | 5 |  |
|  |  | | | **100%** | 15 |  |
|  | | | | | | |
| **Midterm**  **25** | Midterm Q1 | *CLO1* | 10 | 40% | 10 |  |
| Midterm Q2 | *CLO1* | 5 | 20% | 5 |  |
|  | Midterm Q3 | *CLO2* | 5 | 20% | 5 |  |
|  | Midterm Q4 | *CLO2* | 5 | 20% | 5 |  |
|  | **Total Midterm %** | | | **100%** | **25** |  |
|  | | | | | | |
| **Project/CCP**  **10** | Project/CCP | *CLO1/2/3* | 10 |  |  |  |
|  | **Total Project /CCP %** | | | **100%** | **10** |  |
|  | | | | | | |
| **Final Exam**  **40** | Final Exam Q1 | *CLO1* | 10 | 25% | 10 |  |
| Final Exam Q2 | *CLO2* | 10 | 25% | 10 |  |
| Final Exam Q3 | *CLO3* | 10 | 25% | 10 |  |
|  | Final Exam Q4 | *CLO3* | 10 | 25% | 10 |  |
|  | **Total Final Exam %** | | | **100%** | **40** |  |
| **100** | **Total Marls** | | | | **100** |  |
| ***Note: Please make sure every CLO must be assessed at least 3 time.*** | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. **Weekly Plan** | | | | |
| **Week** | **Lecture No** | **Topic Covered** | **CLO/1/2/3** | **Assessment Tool (Quiz#, Mid, Final)** |
| 1 | 1 | Definition and scope of AI | **CLO1** |  |
| 2 | Historical development | **CLO1** |  |
| 3 | Current state of AI and its applications | **CLO1** |  |
| 2 | 4 | Types of AI Agent and Environments | **CLO1** |  |
| 5 | Introduction to Rational Agent | **CLO1** |  |
| 6 | Structure of Rational Agent | **CLO1** |  |
| 3 | 7 | Simple Reflex Agents | **CLO2** |  |
| 7 | Goal based agents | **CLO2** | **QUIZ#1** |
| 9 | Learning agents | **CLO2** | **ASSIGN1** |
| 4 | 10 | Solving Problems by Searching: Problem formulation, 8 puzzle, 8 queens, | **CLO2** |  |
| 11 | Measuring Problem Solving performance | **CLO1** |  |
| 12 | Uninformed Search Strategies: BFS Uniform cost, Depth First. Queue approach to BFS and DFS | **CLO1** |  |
| 5 | 13 | Depth limited, Iterative deepening cost | **CLO1** |  |
| 14 | Informed Search Methods | **CLO2** |  |
| 15 | Heuristic Search | **CLO2** |  |
| 6 | 16 | Greedy Search, A\* Search (Conti….) | **CLO2** | **Assignment 2** |
| 17 | Greedy Search, A\* Search (Conti….) |  |  |
| 18 | Greedy Search, A\* Search | **CLO2** |  |
| **7** | 19 | Local Search: Hill Climbing, (Conti..) |  |  |
|  | 20 | Local Search: Hill Climbing, Genetic Algorithm |  |  |
|  | 21 | **CCP / Project Assignment** |  |  |
| **8** | **Midterm Exam** | | | |
| 9 | 22 | Game Theory: Min max algorithm, | **CLO3** |  |
| 23 | Game Theory: Min max algorithm, Alpha beta pruning algorithm | **CLO1** |  |
| 24 | Game Theory: Alpha beta pruning algorithm, Revision | **CLO1** |  |
| 10 | 25 | Introduction to Fuzzy Logic- CRISP Set to FUZZY Sets: | **CLO1** |  |
| 26 | Crispy Set, Sets (Basic & Concepts), Fuzzy Sets Vs Crisp Sets – | **CLO2** | **Assignment 3** |
| 27 | Additional Properties, Representation of Fuzzy Sets | **CLO2** |  |
| 11 | 28 | Operation on Fuzzy Sets – Types of Operations, | **CLO2** |  |
| 29 | Fuzzy Complements, Fuzzy intersection, union, combination, aggregation operations (Conti..) | **CLO3** |  |
| 30 | Fuzzy Complements, Fuzzy intersection, union, combination, aggregation operations | **CLO3** |  |
| 12 | 31 | Fuzzy Relations, Fuzzy Inference, | **CLO3** |  |
| 32 | Fuzzification of the input variables, Rule evaluation, | **CLO3** | **Quiz 2** |
| 33 | Aggregation of the rule outputs, Defuzzification, | **CLO1** |  |
| 13 | 34 | Process of developing a fuzzy expert system, | **CLO1** |  |
| 35 | Operation of a fuzzy expert system | **CLO1** |  |
| 36 | Examples: Air Conditioner | **CLO1** |  |
| 14 | 37 | Advanced Topics: Introduction to Machine Learning, | **CLO1** |  |
| 38 | Types of Learning (selected topics) |  |  |
| 49 | Types of Learning (selected topics) | **CLO2** |  |
| 15 | 40 | Advanced Topics: Naïve Bayes (Conti…) |  |  |
| 41 | Advanced Topics: Naïve Bayes | **CLO2** | **Quiz3** |
| 42 | Advanced Topics: K-mean (Conti..) | **CLO2** |  |
| 16 | 43 | Advanced Topics: ANN | **CLO2** |  |
| **44** | **CCP/ Project Assessment** | **CLO1** |  |
| **45** | **Revision** |  |  |
| **17** | **Final Exam** | | | |

|  |  |
| --- | --- |
| 1. **IU Assessment / grading Policy** | **Instructor grading for course \*** |
| Quizzes 10-15%  Assignments 10-15%  Projects/Presentation/CCP 0-10%  Mid Semester Examination/ 20-30%  End Semester Examination 40-50% | 10  15  10  25  40 |