

**Department of Software Engineering (SWE)**

**Faculty of Science and Information Technology (FSIT)**

**Daffodil International University (DIU)**

**(Version 1.0)**

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| **PART A: INTRODUCTION** | | | | | | | | | | | | | | | | | | | | | | |
| **1** | **Course Code** | | SE 333 | | | | | | | | | | | | | | | | | | | |
| **2** | **Course Title** | | Artificial Intelligence | | | | | | | | | | | | | | | | | | | |
| **3** | **Course Type (Core University /Program/Elective)** | | Core | | | | | | | | | | | | | | | | | | | |
| **4** | **Level/Term** | | L4-T2 | | | | | | | | | | | | | | | | | | | |
| **5** | **Academic Session** | | Spring 2023 | | | | | | | | | | | | | | | | | | | |
| **6** | **Course Instructor** | | Nuruzzaman Faruqui | | | | | | | | | | | | | | | | | | | |
| **7** | **Pre-requisite** | | SE 214, SE 234 | | | | | | | | | | | | | | | | | | | |
| **8** | **Credit Value** | | 3.0 | | | | | | | | | | | | | | | | | | | |
| **9** | **Contact Hours** | | 3 Hours Per week | | | | | | | | | | | | | | | | | | | |
| **10** | **Total Marks** | | 100 | | | | | | | | | | | | | | | | | | | |
| **11** | **Course Summary** | | Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. The rapid rise of AI started back then in the 1980s. And it has evolved from basic search algorithms to deep learning algorithms, which exhibit human-like intelligence. This course has been designed to understand the fundamental concepts of AI algorithms, implement them and apply them to solve real-world problems. | | | | | | | | | | | | | | | | | | | |
| **12** | **Course Objectives** | | The main objectives of the course is to:   1. Provide the students with comprehensive and in-depth knowledge of AI principles and techniques. 2. Introduce AI’s fundamental problems. 3. Introduce the state-of-the-art models and algorithms. | | | | | | | | | | | | | | | | | | | |
| **13** | **Course Learning Outcomes (CLO)** | | **By the end of semester, students should be able to:** | | | | | | | | | | | | | | | | | | | |
| **CLO1** | | **Understand** the mathematical background of AI in terms of data structure and other abstraction. | | | | | | | | | | | | | | | | | |
| **CLO2** | | **Apply** AI algorithms using Python programming language. | | | | | | | | | | | | | | | | | |
| **CLO3** | | **Assess** real-world problems by applying the concept of artificial intelligence. | | | | | | | | | | | | | | | | | |
| **CLO4** | | **Utilize** the practical aspects of AI in real-world. | | | | | | | | | | | | | | | | | |
| **CLO5** | | **Present and defend** AI based solutions. | | | | | | | | | | | | | | | | | |
| **14** | **Mapping/Alignment of CLOs with Program Learning Outcomes (PLO)** | | **PLO/**  **CLO** | **SWE PLOs** | | | | | | | | | | | | | | | | | | |
| **PLO1** | | **PLO2** | **PLO3** | | **PLO4** | **PLO5** | **PLO6** | **PLO7** | | **PLO8** | **PLO9** | | **PLO10** | | **PLO11** | | **PLO12** | |
| **CLO1** | **1** | | **1** |  | |  |  |  |  | |  |  | |  | |  | |  | |
| **CLO2** | **1** | | **2** |  | |  |  |  |  | |  |  | |  | |  | |  | |
| **CLO3** | **1** | | **2** |  | |  |  |  |  | |  |  | |  | |  | |  | |
| **CLO4** | **2** | | **2** |  | |  |  |  |  | |  |  | |  | |  | |  | |
| **CLO5** |  | |  |  | |  |  |  |  | |  |  | | **1** | |  | |  | |
| **PART B: CONTENT OF THE COURSE** | | | | | | | | | | | | | | | | | | | | | |  |
| **Week** | | **Syllabus** | | | | | | **Learning Outcome** | | | | | **Complexity Level** | | | **CLO** | | **PLO** | | **Assessment** | |  |
| **1** | | Introduction to Artificial Intelligence  Class 1: Introduction to AI, Components of AI, Agents, Environments, and fundamental challenges of AI.  Class 2: Intelligence, limitation of electronic systems, the concept of human complex human perception to logical sentence conversion, and overview of the course. | | | | | | 1. Able to understand what intelligence and artificial intelligence are.  2. Able to conceptualize the intelligence  3. Understanding the AI evolution starting from Basic Search Algorithms to human intelligence like Artificial Neural Network (ANN) | | | | | C1 | | | 1 | | 1,2 | | Class Test  Mid Exam | |  |
| **2** | | AI Terminologies and Search Algorithms  Class 1: Terminologies related to AI and forming the based idea of search algorithms. Working principle for informed search algorithms: BFS and DFS.  Class 2: Working principle of uninformed search algorithms: GBFS, A\* Search. Introduction to Adversarial Search Algorithm & designing simple AI game logic. | | | | | | 1. Understanding the first step of Artificial Intelligence: Search Algorithms.  2. Able to understand the basic terminologies related to AI.  3. Gaining ability to abridge the concept of data structure and search algorithms.  4. Developing the skill set to prepare pseudo-codes from the AI concept to implement them in the laboratory. | | | | | C2 | | | 1 | | 1,2 | | Class Test  Mid Exam | |  |
| **3** | | Knowledge Representation  Class 1: Forming logical sentences, compound statements using logical connectives and statement modeling.  Class 2: Inference Algorithm and Knowledge Engineering. Inference through Resolution. | | | | | | 1. Understanding the challenges of representing complex human semantics in logical sentences.  2. Gaining the ability to derive new knowledge form logical sentences. | | | | | C2 | | | 2 | | 1,2 | | Class Test  Mid Exam | |  |
| **4** | | Uncertainty  Class 1: Application of probability in AI, Bayes’ rules, and joint probability.  Class 2: Bayesian Networks, Approximate inference. Markov assumption, Markov chain, Markov hidden models, and sensor model. | | | | | | 1. Gaining the ability to apply the concept of probability in AI.  2. Developing skills to develop a probabilistic model using random multi-dependent variables.  3. Building the skill set to handle uncertainty over time using both the actual and senor model. | | | | | C2 | | | 2 | | 1,2 | | Class Test  Mid Exam | |  |
| **5** | | Optimization:  Class 1: Concept of optimization and formation of the state space landscape, AI optimization algorithm design.  Class 2: Different existing optimization algorithms and their applications Principles of constraints satisfaction model. | | | | | | 1. Building the skill set of problem space formation for optimization.  2. Gaining the insights of existing optimization algorithms. | | | | | C2 | | | 2 | | 1,2 | | Class Test  Mid Exam | |  |
| MID EXAM | | | | | | | | | | | | | | | | | | | | | |  |
| **6** | | Machine Learning I  Class 1: Mathematical background of machine learning.  Class 2: Learning algorithm formation and optimization. | | | | | | 1. Gaining the ability to understand the mathematical background of Machine Learning.  2. Understanding the conceptual difference and building blocks of machine learning algorithms. | | | | | C3 | | | 3 | | 1,2 | | Presentation  Final Exam | |  |
| **7** | | Machine Learning II  Class 3: Different types of machine learning algorithms.  Class 4: Implementation of machine learning algorithms | | | | | | 3. Developing the skillset to apply machine learning algorithms to solve real world problems. | | | | | C3 | | | 3 | | 1,2 | | Presentation  Final Exam | |  |
| **8** | | Deep Learning I  Class 1: Deep Learning, Neural Network to Artificial Neural Network, Activation functions, Learning algorithms.  Class 2: Multilayer Neural Network, Backpropagation Algorithm, Handling Overfitting, and Underfitting, and different optimization algorithms. | | | | | | 1. Gaining the ability to conceptualize the working principle of biological neural networks and artificial neural networks.  2. Understanding the related terminologies and their role in neural networks.  3. Building the skillset to design, train and optimize multilayer neural networks. | | | | | C3 | | | 4 | | 1,2 | | Assignment  Final Exam | |  |
| **9** | | Deep Learning II  Class 1: Convolutional Neural Networks.  Class 2: Object detection frameworks. | | | | | | 1. Building the skillset to design, train and optimize multilayer neural networks to classify, detect, and segment images. | | | | | C3 | | | 4 | | 1,2 | | Assignment  Final Exam | |  |
| **10** | | Natural Language Processing I  Class 1: Syntax & semantics, formal grammar to context free grammar, tokenization, Markov model.  Class 2: Text Categorization, Naïve Bayes, Smoothing (Additive, Laplace), Topic Modeling. | | | | | | 1. Gaining the ability to understand the core principle of the natural language process.  2. Building the skillset process natural language dataset. | | | | | C3 | | | 5 | | 1,2 | | Assignment  Final Exam | |  |
| **11** | | Natural Language Processing II  Class 1: WordVector and Neural Network Training. | | | | | | 3. Gaining the ability to use WordVector to train deep neural networks for natural language processing. | | | | | C3 | | | 5 | | 1,2,10 | | Assignment  Final Exam | |  |
| **FINAL EXAM** | | | | | | | | | | | | | | | | | | | | | |  |

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| **PART C: ASSESSMENT AND EVALUATION** | | | | | | | | |
| **19** | **Assessment Methods** | **Methods** | **Weighting** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| Attendance | 7% | 0% | 0% | 0% | 0% | 0% |
| Class Test | 15% | 5% | 5% | 0% | 5% | 0% |
| Presentation | 8% | 0% | 0% | 0% | 0% | 8% |
| Assignment | 5% | 0% | 0% | 5% | 0% | 0% |
| Mid-Term Exam | 25% | 10% | 15% | 0% | 0% | 0% |
| Lab | 0% | 0% | 0% | 0% | 0% | 0% |
| Final Exam | 40% | 0% | 0% | 20% | 20% | 0% |
| **Total** | **100%** | 15% | 20% | 25% | 25% | 8% |
| **20** | **Grading System** | **Marks** | **Grade** | **Grade Point** | **Remark** | |  | |
| **80-100%** | A + | 4 | Outstanding | |
| **75-79%** | A | 3.75 | Excellent | |
| **70-74%** | A- | 3.5 | Very Good | |
| **65-69%** | B+ | 3.25 | Good | |
| **60-64%** | B | 3 | Satisfactory | |
| **55-59%** | B- | 2.75 | Above Average | |
| **50-54%** | C+ | 2.5 | Average | |
| **45-49%** | C | 2.25 | Below Average | |
| **40-44%** | D | 2 | Pass | |
| **00-39%** | F | 0 | Fail | |
| **21** | **Make-up Procedures** | Improvement Exam (Students who have failed or received unsatisfactory grades (less than or equal to B) in the regular examinations and thus want to improve their grades), and Incomplete (I) Exam. | | | | | | |

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| **PART D: LEARNING RESOURCES** | | |
| **22** | **Textbook(s)** | Artificial Intelligence: A Modern Approach By Stuart Russell and Peter Norvig. |
| **23** | **Reference Books(s)** | Developing Intelligent Agent Systems: A Practical Guide by Lin Padgham, Michael Winikoff. |
| Intelligent Agent Technology By Ahmed Elmahalawy. |
| **24** | **Other Resources**  **(Online Resources or others)** | N/A |

**Signatures:**

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**Course Teacher**

**Name: Nuruzzaman Faruqui**

**Director of IQAC**

**Name: Professor Dr. A. K. M. Fazlul Haque**

**Head SWE**

**Name: Associate Professor Dr. Imran Mahmud**

**Chair of**

**Course Development Committee**

**Name:**

**Chair of**

**Accreditation Committee**

**Name:**