**Course Outlines of**

**CSE 422: Introduction to Artificial Intelligence**

**Semester:  Summer 2019**

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| **Faculty Information:**  Dr. Mohammad Zavid Parvez  Assistant Professor  Dept. of Computer Science and Engineering  BRAC University  Room # UB80707, Building # 8  Email: [zavid.parvez@bracu.ac.bd](mailto:zavid.parvez@bracu.ac.bd) | | | | |  | |
| **Course Description:**  Survey of concepts in artificial intelligence. Knowledge representation, search and Control techniques. Problem Representation; search, constraint propagation, rule chaining, frame inheritance, inference and learning in intelligent systems; systems for general problems solving, game playing, expert consultation, concept formation and natural languages processing; recognition, understanding and translation. Use of heuristic vs. algorithmic programming; cognitive simulations - vs. machine intelligence; study of some expert systems such as robotics and understanding. Solving problems in Al languages. | | | | | | |
| **Pre-requisites:**  CSE221: Algorithms | | | | | | |
| **Course Outcomes:** | | | | | | |
| CO1 | | | | **Understand** the fundamental concepts of AI | | |
| CO2 | | | | **Analyze** different Uninformed searching Strategies for state space search | | |
| CO3 | | | | **Analyze** different Heuristic search and constraint propagation techniques for machine intelligence | | |
| CO4 | | | | **Generalize** logical games, and game playing algorithms. | | |
| CO5 | | | | **Interpret** Uncertain Knowledge with conditional probability by introducing Bayesian Network. | | |
| CO6 | | | | **Integrate** statistical Learning algorithms for AI applications. | | |
| CO7 | | | | **Interpret** Natural Language Processing techniques | | |
| CO8 | | | | **Develop** AI projectsusingmodern tools | | |
| **Course Outlines:** | | | | | | |
| Sr. No. | | Topic Details | | | | **Time Allocation** |
| 1. | | Introduction to artificial intelligence. Related research fields. AI history. Intelligent Agents, Agents and Environments, Structure of Agents, Rationality | | | | **Week 1** |
| 2. | | Problem Solving by Searching, Problem Solving Agents, Searching for Solutions,  Review of tree structure, Review of graph structure, Graph implementation  Search graph and search tree, State space representation | | | | **Week 2** |
| 3. | | Uninformed Search Random search, Breadth-First Search, Depth-First Search, Depth-limited Search, Iterative Deepening Depth-first Search, Comparison of Uninformed Search Strategies. | | | | **Week 3** |
| 4. | | Informed (Heuristic) Search Strategies: Greedy Best-first Search, A\* Search, Heuristic Functions, Local Search Algorithms and Optimization Problems. | | | | **Week 4,5** |
| 5. | | Constraint Propagation Problem: Backtracking Search for CSPs, Local Search for CSPs. | | | | **Week 6** |
| 6. | | Game Theory: Finding optimal configurations, Games, Minimax Algorithm, Alpha-Beta Pruning | | | | **Week 7** |
| 7. | | Probabilistic Reasoning: Logic and probabilistic inference, elementary principles of probability | | | | **Week 8,9** |
| 8. | | Acting Under Uncertainty, Bayes’ Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks. | | | | **Week 10** |
| 9. | | Fundamental Concept and basic algorithms of Machine Learning Naïve Bayes | | | | **Week 11** |
| 10. | | Forms of Learning, Decision Trees and the ID3 Algorithm, Statistical Learning, Summary of other Approaches. | | | | **Week 12** |
| 11. | | Basic of Natural Language Processing techniques and algorithms | | | | **Week 13** |
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| **Course Assessment Methods:** | | | | | | |  |  |
|  | **Homework** | | | | |  |
|  | Homework/ assignment shall be designed to ensure that the students have the required knowledge to analyze and design control systems. Specifically, they will support the students’ progress in the project/Laboratory | | | | |  |
|  | **Quizzes** | | | | | |  |
|  | Quizzes will be designed to test the students' understanding in the course and to assess various course outcomes | | | | |  |
|  | **Examinations** | | | | | |  |
|  | The exam shall contain problems designed to test knowledge and comprehension, to analyze control systems, and/or to apply the engineering problem solving method. | | | | |  |
|  | **Laboratory Work** | | | | | |  |
|  | The students will have hands-on experience in the design and analysis of programs. They will learn how to use EMU8086 and 8086 Microprocessor kit. The students will be assessed during each Lab session via Lab performance and reports in each Lab Session. | | | | |  |
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| **Assessment Methods vs. Course Outcomes:**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Assessment Methods** | **CO 1** | **CO 2** | **CO 3** | **CO 4** | **CO 5** | **CO 6** | **CO 7** | **CO 8** | | Homework |  |  |  | X |  |  | X |  | | Quizzes |  | X | X |  | X | X |  |  | | Examinations | X | X | X | X | X | X | X |  | | Laboratory Works |  |  | X |  | X | X |  |  | | Project |  |  |  |  |  |  |  | X | | | | | | | |
| **Textbook**   1. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach. 3rd Edition. Prentice Hall, 2010. 2. “Python code for Artificial Intelligence: Foundations of Computational Agents,” a tutorial that written by David L. Poole and Alan K. Mackworth, May 28, 2018 3. “Artificial Intelligence with Python written by Prateek Joshi, January 2017 | | | | | | |
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| **Supporting Tools** | | | | | |  |
|  | | | Lecture Notes and other material will be made available on the course website.( \\tsr\Summer-2019\CSE\MZP\CSE422 [AI]) | | | |
| **Additional Resource** | | | | | |  |
| 1. MIT Artificial Intelligence, <https://www.youtube.com/watch?v=TjZBTDzGeGg&vl=en> 2. “Python code for Artificial Intelligence: Foundations of Computational Agents,” a tutorial that written by David L. Poole and Alan K. Mackworth, May 28, 2018 3. “Artificial Intelligence with Python written by Prateek Joshi, January 2017 | | | | | | |

**Course Policies:**

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|  | **Class Policy** | |
|  | * Classroom and laboratory attendance are mandatory. You should come to the classroom before the instructor. Late comers may/ may not be allowed to enter the classroom. Students, who are absent over 30% of the class time will not be allowed to enter the final examination * You should turn off your cellular phone before entering the classroom. You should not leave the classroom to make or take cellular phone calls * You should bring a notepad and/or a writing instrument to every class and take detailed notes. * You should pay attention to the instructor and participate in class discussions. * You should not do other work during class time. |  |
|  | **Honor Code** | |
|  | Any form of cheating, plagiarism, and/or academic dishonesty will result in an "F" grade in the course. |  |
|  | **Late Work and Examinations** | |
|  | Late assignments will not be accepted. Students who know that they are going to miss class should make arrangements in advance. Exams will be closed book. There will not be any make-up for quizzes and midterm exams except the cases of hospitalization or detention |  |

**Grading Policies:**

Student’s grades are assigned according to the grading scale of the Brac University Undergraduate Study and Examinations Regulations. In addition, the faculties are allowed to take into consideration the class average and standard deviation to reflect the actual class performance for student grade assignment. The grades at the university will be indicated in the following manner:

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| **Marks** | **Grades** |
| 90-100 | A (4.0) |
| 85- <90 | A- (3.7) |
| 80- <85 | B+ (3.3) |
| 75- <80 | B (3.0) |
| 70- <75 | B- (2.7) |
| 65- <70 | C+ (2.3) |
| 60- <65 | C (2.0) |
| 57- <60 | C- (1.7) |
| 55- <57 | D+ (1.3) |
| 52- <55 | D (1.0) |
| 50- <52 | D- (0.7) |
| <50 | F (0.0) |
| P | Pass |
| I | Incomplete |
| W | Withdrawal |
| R | Retaken |

**Course Assessment Methods:**

Guidelines for CSE course teaching in BRAC University. The following assessment methods are based on Theory Course with Lab.

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| **Section** | **Marks (%)** |
| 1. Participation in class | 5 % |
| 1. Quizzes/Class Tests/Assignments/ | 10 % - 15 % |
| 1. Mid Term Examination | 20 % - 25 % |
| 1. Lab & Project | 20 % - 30 % |
| 1. Final | 30 % - 40 % |
| **Total** | **100 %** |

**Prepared By:**  Dr. Md. Iftekharul Mobin, Dr Md. Golam Rabiul Alam, Dr Mohammad Zavid Parvez