City University
Department of Computer Science and Engineering
Faculty of Science and Engineering

Course Outline

Course Code and Title, CSE – 417: Artificial Intelligence
Credit Hours: 3
Prerequisites: CSE 114, CSE 214

Program: B. Sc. in Computer Science & Engineering (CSE),
Semester: Fall 2018
Total Weeks: 13 **Hours/Week:** 3 **Total Hours:** 39^{+}

Instructor: Supta Richard Philip
Designation: Senior Lecturer
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Office Hrs: By appointment

Course Details
Rationale:
The course is designed to introduce students to the structures and strategies used for unstructured problem solving. Emphasis is given on knowledge representation, reasoning under uncertainty, machine learning, natural language processing, and implementation using a natural languages. The course is suitable for students who seek a career in artificial intelligence, computer science, information technology, or software engineering.

Course Objectives:
1. Discuss AI models and areas of application.
2. Discuss the basic concepts and algorithms for both the symbol-based model and the connectionist model for machine learning.
3. Able to explain the theories, methods and practices which form the basis of artificial intelligence.
4. Able to critically read text material and extract useful knowledge applicable to the specific course contents.
5. Effectively solve problems relating to topics discussed in class and in the literature.
6. Effectively frame real-world problems into problems solvable by existing techniques in artificial intelligence.

Intended learning outcomes (ILOs) of the Course:

Knowledge	**LO1:** Knowledge of what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.
	LO2: Explain how Artificial Intelligence enables capabilities that are beyond conventional technology, for example, chess-playing computers, self-driving cars, robotic vacuum cleaners.
	LO3: Implement classical Artificial Intelligence techniques, such as search algorithms, mini max algorithm, neural networks, tracking, and robot localization.
	LO4: Ability to apply Artificial Intelligence techniques for problem solving also explain the limitations of current Artificial Intelligence techniques.
Skills	Will develop skills on understanding the problems
	Will gain skills on analysis the problem and selecting the solutions for the problem.
	Will help in achieving communication, demonstrate and presentation skill.
Attitude	Will develop attitude to group dynamics and team work.
	Will create attitude to tackle challenges related to computer and basic software.
	Will create positive attitude to listen ideas of classmates.

Mapping of Course ILO and PLO:

Learning Outcome (LO) of the Course	Program Learning Outcome (PLO)											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	
LO1	**MJ**	**MJ**	**MJ**	**MJ**	**MJ**			**MN**		**MJ**	**MN**	
LO2	**MJ**	**MJ**	**MJ**	**MJ**						**MJ**	**MN**	
LO3	**MJ**	**MJ**	**MJ**	**MN**	**MN**					**MJ**	**MN**	
LO4	**MJ**	**MJ**	**MN**		**MN**					**MJ**	**MN**	

Course Contents:

SL. NO	ILO	Topic	Teaching Strategy	Assessment Strategy	No of Sessions
1	1	Artificial Intelligence and Predicate Calculus: An introduction to artificial intelligence and predicate calculus. It presents AI roots and applications, and explains the concepts related to propositional and predicate calculus.	Lecture, Exercise	Q/A, Quiz	01
2	1,4	AI Programming Languages: Prolog and Python: The main concepts related to the AI programming languages Prolog and Python. It presents the syntax, data types, and control mechanisms for both languages.	Lecture, Exercise	Q/A, Quiz	02
3	1,2	Graph Theory and Strategies for State Space Searches: Concepts related to graph theory and finite state machines. It presents state space search algorithms and reasoning strategies.	Lecture, Exercise	Q/A, Test, Assignment	02
4	2,4	Heuristic Search Algorithms :Heuristic search issues and applications. It presents algorithms such as hill-climbing, dynamic programming, and best-first search.	Lecture, Exercise	Q/A, Test, Assignment	02
5	2,3,4	Control and Implementation of State Space Searches: Issues related to the control and implementation of state space search. It presents recursion-based searching and discusses architectures such as production and blackboard systems.	Lecture, Exercise	Q/A, Test, Assignment	02
6	2,3	Knowledge Representation: Concepts and issues related to knowledge representation. It discusses onto logiest and agent-based systems.	Lecture, Exercise	Q/A, Quiz	02
7	2,3,4	Expert Systems and Problem Solving : The expert systems model for problem solving. Other models for problem solving such as case-based reasoning, model-based reasoning, and hybrid models are discussed.	Lecture, Exercise	Q/A, Presentation	02
8	2,3	Natural Language Understanding: This unit will provide you with a basic introduction to Natural Language Understanding (NLU) in AI. Syntax, semantics, and ambiguity of natural language are discussed to introduce the problems and approach.	Lecture, Exercise	Q/A, Test, Assignment Presentation	03
9	3,4	Introduction to Machine Learning: It presents the basic concepts and algorithms for both the symbol-based and connectionist models.	Lecture, Exercise	Q/A, Test, Assignment	02
10	3,4	AI applications (Vision/Robotics/NLP). Some of the contributions of AI to robotics are search algorithms, representation and models for the robot world, inference, learning, and AI programming features and their integration.	Lecture, Exercise	Q/A, Test, Assignment	02

Teaching Learning Methods:

Analyze and solve knowledge-based problems for practical situation
Group discussion
Lecture slides, presentations, audio and video
Analytical and critical thinking approach to understand real life system and models

Assessment Schedule:

Assessment 1	Quizzes	Week 4, Week 10
Assessment 2	Assignments	Week 5, Week 11
Assessment 3	Presentation	Week 5, Week 11
Assessment 4	Mid-Term Exam	Week 6
Assessment 5	Final Exam	Week 12

Weights of Assessments:

Assessments	%
Mid-Term Exam	30
Final Exam	40
Quizzes	10
Assignments	10
Presentation	10
Total	**100**

Grading Policy:

Policy	Letter Grade	Grade Point	Assessments
80% and above	A+	4.00	Outstanding
75% to below 80%	A	3.75	Superlative
70% to below 75%	A-	3.50	Excellent
65% to below 70%	B+	3.25	Very Good
60% to below 65%	B	3.00	Good
55% to below 60%	B-	2.75	Average
50% to below 55%	C+	2.50	Below Average
45% to below 50%	C	2.25	Passing
40% to below 45%	D	2.00	Probationary
Below 40%	F	-----	Fail

List of References:

Course Notes: Follow Lecture notes

Essential Books (Text Books):

1. Artificial Intelligence: A Modern Approach, S. Russell and P. Norvig, Prentice Hall, ISBN0-13-080302-2

Recommended Reference Books:

1. Principles of Artificial Intelligence, Nills J. Nilson
2. Introduction to Artificial Neural Networks, J. M. Zurada

Online Recourses: Use Internet to get documents on specific topics

Facilities Required for Teaching and Learning:

Projector, Whiteboard, Internet access from classroom computer, Audio/Visual equipment.

Course Policies and Procedures:

1. **Class attendance:** Regular attendances of classes are mandatory and students will be assigned F automatically if he/she misses 6 consecutive classes.
2. **Late submission of work:** Late submission will be followed by penalty, please maintain deadlines.
3. **Unfair means /plagiarism:** Plagiarism will be dealt with severe penalty. Original work is encouraged as they will carry value marks.

Appendix-1: Program Learning Outcome (PLO)

PLO No.	PLO
1.	Engineering Knowledge
2.	Problem Analysis
3.	Design/Development of Solutions
4.	Investigation
5.	Modern Tool Usage
6.	The Engineer and Society
7.	Environment and Sustainability
8.	Ethics
9.	Communication
10.	Individual and Team Work
11.	Life Long Learning
12.	Project Management and Finance

Professional/Generic Skills (Detailed):

1. **Engineering Knowledge (T)** -Apply knowledge of mathematics, sciences, engineering fundamentals and manufacturing engineering to the solution of complex engineering problems;
2. **Problem Analysis (T)** – Identify, formulate, research relevant literature and analyze complex engineering problems, and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences;
3. **Design/Development of Solutions (A)** –Design solutions, exhibiting innovativeness, for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, economical, ethical, environmental and sustainability issues.
4. **Investigation (D)** Conduct investigation into complex problems, displaying creativeness, using research-based knowledge, and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;
5. **Modern Tool Usage (A & D)** -Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations;
6. **The Engineer and Society (ESSE)** -Apply reasoning based on contextual knowledge to assess societal, health, safety, legal, cultural, contemporary issues, and the consequent responsibilities relevant to professional engineering practices.
7. **Environment and Sustainability (ESSE)** -Understand the impact of professional engineering solutions in societal, global, and environmental contexts and demonstrate knowledge of and need for sustainable development.
8. **Ethics (ESSE)** –Apply professional ethics with moral values and commit to responsibilities and norms of professional engineering code of practices.
9. **Communication (S)** -Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
10. **Individual and Team Work (S)** -Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
11. **Life Long Learning (S)** -Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
12. **Project Management and Finance (S)** -Demonstrate knowledge and understanding of engineering management and financial principles and apply these to one's own work, as a member and/or leader in a team, to manage projects in multidisciplinary settings, and identify opportunities of entrepreneurship.

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Course Coordinator/ Teacher *Head of the Department*

Date: *Date:*