CSC-411 Artificial Intelligence	
Course Title:	***Artificial Intelligence***
Course Code:	CSC-411
Pre-Requisites:	
Credit Hours Theory:	3
Credit Hours Lab (If Applicable):	0
Course Objectives:	Artificial Intelligence (AI) is a constantly and actively growing and changing field. In this course, students will learn the basics of modern AI as well as some of the representative applications of AI.
Learning Outcomes:	After the successful completion of course, the students will be able to: **CLO-1***:* Know various AI search algorithms (tree search, uninformed, informed, and heuristic), understand different types of AI agents, know how to build simple knowledge-based systems. **CLO-2***:* Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems.
Contents (Catalog Description):	This course introduces students to the basic knowledge representation, problem solving, and learning methods of artificial intelligence. Upon completion, students should be able to develop intelligent systems by assembling solutions to concrete computational problems; understand the role of knowledge representation, problem solving, and learning in intelligent-system engineering; and appreciate the role of problem solving, vision, and language in understanding human intelligence from a computational perspective.
Recommended Text Books:	S. J. Russell and P. Norvig, **Artificial Intelligence: A Modern Approach,** Prentice-Hall.
Reference Books:	• Koller and Friedman. Probabilistic Graphical Models. • Sutton and Barto. Reinforcement Learning: An Introduction. • Hastie, Tibshirani, and Friedman. The elements of statistical learning. • Tsang. Foundations of constraint satisfaction
Helping Web Sites:	
General Instructions for students:	Attendance is mandatory. Every class is important. All deadlines are hard. Under normal circumstances late work will not be accepted. Students are required to take all the tests. No make-up tests will be given under normal circumstances. There is 0 tolerance for plagiarism. Any form of cheating on exams/assignments/quizzes is subject to serious penalty. Attendance 75% attendance is mandatory. Latecomers will be marked as absent.

	Evaluation Criteria Assignments/projects 20% Quizzes 10% Mid-Term 20% Final 50%

Sixteen Week Lesson Plan	**Week**	**Topics Covered**
	1	1st Lecture Introduction and Scope, Problem Solving 2nd Lecture Tree Search, Graph Search, BFS, UCS 3rd Lecture A* Search, State Spaces, Problems with Search
	2	1st Lecture Probability in AI, Dependence 2nd Lecture Bayes Rule, Conditional Independence, Independence 3rd Lecture General Bayes Net, D Separation
	3	1st Lecture Probabilistic Inference, Enumeration, Causal Direction 2nd Lecture Variable Elimination, Approximate Inference 3rd Lecture Gibbs Sampling, Markov Chain Monte Carlo
	4	1st Lecture Machine Learning, Relationship to Bayes Network, Linear Regression 2nd Lecture

		Perceptron, Support Vector Machines Quiz 1 3rd Lecture K Nearest Neighbors, Smoothing Parameters, Problems with KNN
	5	1st Lecture Unsupervised Learning, Dimensions. 2nd Lecture K Means Clustering, Expectation Maximization 3rd Lecture Gaussian Learning, EM Algorithm
	6	1st Lecture Representation with Logic, Propositional Logic, Truth Tables, Quiz 2 2nd Lecture First Order Logic, Terminology, Limitations, 3rd Lecture Models, Syntax, Problems
	7	1st Lecture Problem Solving vs. Planning, Planning vs. Execution, Infinite Sequences 2nd Lecture Classical Planning, Progression Search, Regression Search 3rd Lecture Regression vs. Progression, Plan Space Search, Situation Calculus
	8	1st Lecture Planning Under Uncertainty, MDP Grid World, MDP and Cost 2nd Lecture Value Iteration, Partial Observability

		3rd Lecture POMDP, POMDP vs. MDP
	9	**Mid Term Exam**
	10	1st Lecture Reinforcement Learning, Forms of Learning, Agents of reinforcement learning, Passive Agents, 2nd Lecture Greedy Agents, Balancing Policy, Errors in Utility Questions, Exploration Agents 3rd Lecture Application of Trees: Game Trees, Quiz 3
	11	1st Lecture Hidden Markov Models, Bayes Network of HMMs, Stationary Distribution 2nd Lecture Transition Probabilities, HMM Equations 3rd Lecture Particle Filters, Particle Filter Algorithm, Pros and Cons
	12	1st Lecture Game Theory, Dominant Strategy, Pareto Optimal, Equilibrium 2nd Lecture Mixed Strategy, Geometric Interception 3rd Lecture Game Theory Strategies, Mechanism Design, Quiz 4
	13	1st Lecture Advanced Planning, Scheduling, Extending Planning 2nd Lecture Hierarchical Planning, Refinement Planning 3rd Lecture Reachable States, Conformant Plan, Sensory Plan
	14	1st Lecture

		Computer Vision, Image Formation, Projection Length, Focal Length, Range 2nd Lecture Perspective Projection, Vanishing Points, Invariance 3rd Lecture Linear Filter, Prewitt Mask, Gaussian Kernel, Modern Feature Detectors
	15	1st Lecture Robotics, Kinematics 2nd Lecture Localization, Monte Carlo Localization 3rd Lecture Prediction, Road Graph, Path Planning
	16	1st Lecture Natural Language Processing, Language Models, Bag of Words, Probabilistic Models 2nd Lecture Language and Learning, Unigram Models,, Bigram Model, N Gram Model 3rd Lecture Classification, Segmentation, Spelling Correction, Further Applications
	17	1st Lecture, 2nd Lecture, 3rd Lecture Final Project Presentations & Revisions
	18	**Final Exam**

CONTRIBUTION OF COURSE LEARNING OUTCOMES (CLOs) TO PROGRAMME LEARNING OUTCOMES (PLOs)

BS Software Engineering		**Artificial Intelligence**					
No	**Program Learning Outcomes**	**Course Learning Outcomes**					
		1	**2**	**3**	**4**	**5**	**6**
1	Engineering Knowledge						
2	Problem analysis	✓					
3	Design/Development of solutions						
4	Investigation		✓				
5	Modern tool usage						
6	Engineer and society						
7	Environment and sustainability						
8	Ethics						
9	Individual and Team work						
10	Communication						
11	Project Management						
12	Lifelong learning						