CSCI-360 Introduction to Artificial Intelligence (Section 30304R) – Spring 2016 Syllabus and Schedule

Classes: Wednesday, Friday, 5:00-6:50PM, Room ZHS 163
Office Hours: (see http://www.isi.edu/robots/CS360)
Text Books: Artificial Intelligence: A Modern Approach (AIMA)
Reading Option: Autonomous Learning from the Environment (ALFE)

Week	Date	Topic	Reading	Homework	Project
1	Jan 13 Jan 15	Welcome! Introduction and history of AI, Intelligent agents, systems, and robots. Class structures, lectures, readings, homework, projects, exams, grades	AIMA1 AIMA2 (ALFE-1)		Project-1 out: Robot moves!
2	Jan 20 Jan 22	Problem Solving, Search, and Optimization Problems Representations, goals, and various search algorithms Description of three projects. Project 1 handout	AIMA3 AIMA4 (ALFE-2,6)	HW1, Encode State Space	
3	Jan 27 Jan 29	Game Playing and Constrain Satisfactions Representations and algorithms	AIMA5 AIMA6	HW2: Search	
4	Feb 3 Feb 5	Logical Representations and Reasoning Propositional logic and inferences First-order logic and inferences, and systems	AIMA7 AIMA8 AIMA9	HW3: Logic	Project-1 due
5	Feb 10 Feb 12	Intelligent Actions, Planning, and Robotics Planning and scheduling. General model of robotics, description and handout for Project 2	AIMA10 AIMA11 (ALFE-3, 6.1)	HW4: Planning	Project-2 out: Robot search!
6	Feb 17 Feb 19	Knowledge representations and model representations Logics and probabilities. Knowledge bases, Expert systems, Action models.	AIMA 12 (ALFE-4)	HW5: Game playing	
7	Feb 24 Feb 26	Uncertain Knowledge and Reasoning Uncertainty, Probabilistic Representation & Reasoning, **Bayesian Networks**	AIMA13-14 (ALFE-4)	HW6: Probability	
8	Mar 2 Mar 4	Probabilistic Reasoning over time: Temporal models, **Hidden Markov Models**, Kalman filters, Dynamic Bayesian Networks, Automata theory **Review for midterm exam**	AIMA15 (ALFE-5.10)	HW7: BN HMM, FSA	
9	Mar 9 Mar 11	**Midterm Close-book Exam (all materials above) – in class** Utility Theories, functions, decision networks Sequential decision making, Policies, **MDP**, **PO-MDP**, Multiagent decisions	AIMA 16-17 (ALFE 5)	HW8: POMOP	Project-2 due Project-3 out: Robot learns!
10	Mar 16 Mar 18	**Spring Break (no class)**			
11	Mar 23 Mar 25	**Attribute-Based Learning**: Forms of learning, Model selection, Supervised Learning of **Decision Trees**, PAC learning, Decision Lists, Supervised learning: **Neural Networks**, Support Vector Machines, Ensemble and boost	AIMA18 (ALFE 4.1-5)	HW9: DT, NN, SVMs	
12	Mar 30 Apr 1	**Relation-Based Learning:** Motivations, challenges, and algorithms. Inductive logic programing, Complementary Discrimination Learning	AIMA 19 (ALFE4.6-10)	HW10: NN, CDL	
13	Apr 6 Apr 8	**Probability-Based Learning:** Probabilistic Models, Naïve Bayes Models, EM algorithm, Reinforcement Learning	AIMA 20-21 (ALFE-5.10)	HW11: RF, NBM, EM	
14	Apr 13 Apr 15	**Surprise-Based Learning** (guest lecture by Dr. Nadeesha Ranasinghe) Integrated Perception, Action, Problem Solving, and Learning. The challenge of vision and object/people/activity recognition, and robotic applications.	AIMA 24 (ALFE-7-12)	HW12: SBL	Final exam questions out
15	Apr 20 Apr 22	Introduction to Communication (Natural Language Processing), Collaboration, Self-organization, and Self-reconfiguration	AIMA22-23 Handout		
16	Apr 27 Apr 29	Future intelligent systems - The challenge of robots: with what we have learned, what hard problems remain to be solved? Different types of robots. Tasks that robots are for. Parts of robots. Architectures. Configuration spaces. Navigation, motion planning, locomotion, manipulation, and reconfiguration.	AIMA 25 LAFE-13 Handout		Project3 due
17	May 6?	**Time: Final Close-book Exam (materials of entire semester) – in class**			Final Exam

Project 1: Design and implement a simple robot Rx to move from point A to point B in an open environment.
Project 2: Give Rx intelligence so that it can search and navigate a path from point A to point B in a crowded environment.
Project 3: Make Rx learn from its own experience so that it can find a target in its environment.
Extra-Credit: Make Rx reconfigure or transform itself in order to solve problems in Project 2 and Project 3.

Grade Structure: Midterm: 30%, Final: 30%, Project-1: 5%, Project-2: 10%, Project-3: 15%, Interaction (Quiz) in Class: 10%.
Late Project Penalty: -30% of the project grade for each day that is late.