Course Code	CSE5xx/ECE5xx
Course Name	Reinforcement Learning
Credits	4
Course Offered to	UG/PG
Course Description	The course will introduce reinforcement learning as an approximate dynamic programming problem. We will consider exact versions of value and policy iteration, followed by approximations based on gradient methods, temporal difference based methods, and last but not least, simulation based methods like Q-learning.

Pre-requisites

Pre-requisite (Mandatory)	**Pre-requisite (Desirable)**	**Pre-requisite(other)**
MTH201 Probability & Statistics		

*Please insert more rows if required

Post Conditions

CO1	**CO2**	**CO3**	**CO4**
Students will be able to implement and analyze exact dynamic programming (value and policy iteration) algorithms	Students will be able to describe and implement approximations in value and policy space	Students will be able to describe and implement algorithms for model-free situations	Students will be able to execute projects using commonly available RL libraries

Weekly Lecture Plan

Week Number	**Lecture Topic**	**COs Met**	**Assignment/Labs/Tutorial**
1	Mathematical review		Assignment
2	The problem of sequential decision making under uncertainity, Bellman's optimality condition and the dynamic programming algorithm	C01	Back of the book problems
3,4	Theory of discounted problems: Bounded costs per stage, multi-armed bandit and scheduling, continuous time problems, contraction mappings and monotonicity	C01	Back of the book problems
5,6	Computational methods: Markov Decision Processes, Value and Policy Iteration, Optimistic PI, Limited look ahead, Asynchronous algorithms	C01	Coding assignment and problems
7,8,9	Simulation based cost approximation, gradient methods, projected equation methods, aggregation methods	C02,CO4	Coding assignment and problems
10,11	Q-learning, Actor Critic methods	CO2, CO3, CO4	Coding assignment and problems
12,13	Introduction to Deep reinforcement learning and Inverse Reinforcement Learning	C04	

*Please insert more rows if required

Weekly Lab Plan

Week Number	**Laboratory Exercise**	**COs Met**	**Platform (Hardware/Software)**
Course does not have a lab component			

*Please insert more rows if required

Assessment Plan

Type of Evaluation	**% Contribution in Grade**
Quiz	25
Mid-sem	25
Project	25
End-sem	25

*Please insert more row for other type of Evaluation

Resource Material

Type	**Title**
Textbook	Dynamic Programming and Optimal Control Vol 2 on Approximate Dynamic Programming by Dimitri P. Bertsekas
Textbook	Reinforcement Learning: An introduction by Sutton and Barto