CS409: Reinforcement Learning	L	T	P	Linear algebra, Theory of Probability, Calculus
	3	1	0	

Course Objective: To develop a robust understanding of reinforcement learning principles with emphasis on real-world application.

S. No.	Course Outcomes (CO)
CO1	Explain Core Concepts of Reinforcement Learning
CO2	Implement and Analyze Reinforcement Learning Algorithms
CO3	Design Reinforcement Learning Solutions for Defined Scenarios
CO4	Assess Reinforcement Learning Systems Using Performance Metrics
CO5	Identify and Mitigate Ethical Risks in Reinforcement Learning Applications

S. No	Contents	Contact Hours
UNIT 1	Introduction: Elements of Reinforcement Learning, Episodic vs Continuous Tasks, The Rewards Hypothesis, Cumulative Reward, Multi-armed Bandits: A k -armed Bandit Problem, Action-value Methods, The 10-armed Testbed, Optimistic Initial Values, Gradient Bandit Algorithms	10

UNIT 2	Markov Decision Process: The Agent–Environment Interface, Returns and Episodes, Episodic vs Continuous Tasks, Policies and Value Functions, Optimal Policies and Optimal Value Functions Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous, Dynamic Programming, Generalized Policy Iteration	**10**
UNIT 3	Temporal-Difference Methods, TD Prediction, Advantages of TD Prediction Methods, TD control – Sarsa, TD control- Q-Learning, TD control- Expected Sarsa, Maximization Bias and Double Learning N-step Bootstrapping, N-step TD prediction, N-step Sarsa, N-step Off-policy Learning	**8**
UNIT 4	RL in Continuous Space, Discrete vs Continuous space, Discretization, Functions Approximation, Linear Function Approximation- kernel, Non-Linear Function Approximation	**10**
UNIT 5	Value-Based Network, Deep Q networks, From RL to Deep RL, Deep Q Networks Architectures(DQN), Experience Replay, Fixed Q-Targets, Other Networks- Double DQN, Prioritized Experience Replay, Dueling DQN(Introduction)	**10**
	Total	**48**