EE932 (eMasters) First Course Handout

1.	Module No: **EE932**	
2.	Module Title: **Introduction to Reinforcement Learning**	
3.	Program: **Next Generation Wireless Technologies**	Duration: **8 Weeks** (in weeks)
4.	Instructor(s): **Subrahmanya Swamy Peruru**	
5.	Module Description:	
	Objectives: Reinforcement learning (RL) is a type of machine learning paradigm where an agent learns how to behave in an environment by performing actions and receiving feedback in the form of rewards or penalties. RL algorithms have proven effective in solving intricate problems across diverse domains such as robotics, gaming, finance, and communication networks. This course aims to provide students with a solid understanding of the various RL algorithms, enabling them to apply this knowledge to their specific research areas.	
	Contents	

S. No	Broad Title	Topics	No. of Lectures
1.	**Introduction**	Basic terminology of an RL framework: States, Actions, Reward, Environment, etc.	2
2.	**Multi-armed Bandits**	n-Armed Bandit problem, UCB algorithm, Contextual bandits	5
3.	**Finite Markov Decision Processes and Dynamic Programming**	Markov Decision Process, Value functions, Bellman expectation equation, Bellman optimality equation, Policy Iteration, Value iteration	5
4.	**Monte-Carlo and Temporal-Difference based Tabular methods**	Monte Carlo prediction and control, TD prediction, SARSA, Q-Learning	5
5.	**Function approximation-based methods**	Q-learning with function approximation, Policy gradient methods: REINFORCE, Actor-critic methods	5
6.	**Applications**	Discussion of RL applications	2

6. **Pre-requisites**: Good understanding of Probability and Random variables

7. **Recommended Books:**
   Textbook: Sutton, Richard S., and Andrew G. Barto. *Reinforcement learning: An introduction*. MIT Press, 2018.

8. **Course Evaluation:**
   1. Live session participation – 10%
   2. Quiz 1 – 20%
   3. Quiz 2 - 20%
   4. Assignments (Python-based) – 20%
   5. EndSem – 30%