Name of the Programme: M.Sc. in Artificial Intelligence
Course Code: CSI-513
Title of the Course: Reinforcement Learning Lab
Number of Credits: 2(0L-0T-2P)
Effective from AY: 2023-24

Prerequisites for the course	Linear algebra, multivariable calculus , Basic machine learning knowledge and programming background.	
Objectives	To understand the theory by carrying out the lab assignment based on the key ideas of reinforcement learning.	
Content	1. RL task formulation (action space, state space, environment definition) 2. Tabular based solutions (dynamic programming, Monte Carlo, temporal-difference) 3. Function approximation solutions (Deep Q-networks) 4. Policy gradient from basic (REINFORCE) towards advanced topics (proximal policy optimization, deep deterministic policy gradient, etc.) 5. Model-based reinforcement learning 6. Imitation learning (behavioral cloning, inverse RL, generative adversarial imitation learning) 7. Meta-learning 8. Multi-agent learning, partial observable environments	7 hours 7 hours 7 hours 7 hours 7 hours 7 hours 8 hours 10 hours
Pedagogy	Lab assignments/ mini project	
References/ Readings	1. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019. 2. Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018). 3. Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012): 3. 4. Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach."Pearson Education Limited, 2016. 5. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2016. 6. David Silver's course on Reinforcement Learning (link).	
Course Outcomes	1. Practical implementation skills of reinforcement learning algorithms. 2. Ability to design and analyze experiments for evaluating reinforcement learning systems. 3. Contribution to the field through novel research or innovative applications. 4. Improved collaboration and communication skills within a research lab setting.	

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