

Branch Name:	Artificial Intelligence and Data Science
Program Code:	ET108
Semester/Year:	Semester VII/Fourth Year
Course Name:	Professional Elective –IV: Reinforcement Learning and its application Practical
Course Code:	2ET1080704P
Pre-requisite Course:	Probability, Machine Learning

Course Objective:

1. In this course, we will investigate the process of learning through an agent's mistakes. This is very dissimilar to supervised machine learning and more closely resembles how people learn via experience.
2. The focus of Reinforcement Learning (RL) is on issues that call for a series of decisions to be made in order. The fundamentals of reinforcement learning and its application are the focus of this course.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
1	-	-	2	2	-	-	-	-	10	25	10	25	50

Sr. No	List of Practical	Content Hours
1.	Study the concepts of Reinforcement Learning.	2
2.	Implement random variables and visualize probability distributions.	2
3.	Implement conditional and marginal distributions using simulated data.	2
4.	Study about Markov property and Markov chains.	2
5.	Learn about proof of Bellman equations for MRPs.	2
6.	Learn dynamic programming for MDP.	2
7.	Study proof of convergence of policy evaluation and value iteration algorithms.	2
8.	Implement Monte Carlo methods for model-free Reinforcement Learning.	2
9.	Implement Incremental Monte Carlo methods for model-free prediction.	2
10.	Study about TD Methods.	2
11.	Study about Function Approximation Methods	2
12.	Apply Reinforcement Learning to a real-world or simulated environment	2

List of References:

1. "Reinforcement Learning", Sutton and Barto, MIT Press, 2018
2. "An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications", Rahul Dubey, Cengage India Publication 2019
3. "Reinforcement Learning: Theory and Algorithms" Alekh Agarwal, Nan Jiang, Sham Kakade, and John Langford 2022
4. Machine Learning: A Reinforcement Approach" by Satinder Singh and Sanjay Lal
5. "Artificial Intelligence: Reinforcement Learning in Python: Complete guide to artificial intelligence and machine learning", Lazy Programmer, Kindle Edition 2017

E-Resources:

1. <https://www.synopsys.com/ai/what-is-reinforcement-learning.html>
2. <https://www.simplilearn.com/tutorials/machine-learning-tutorial/reinforcement-learning>
3. <https://www.udemy.com/course/beginner-master-rl-1/>
4. <https://www.guru99.com/reinforcement-learning-tutorial.html>
5. <https://towardsdatascience.com/reinforcement-learning-101-e24b50e1d292>

Course Learning Outcomes (CLO): On completion of this course ,the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Learn how to define RL tasks and the core principals behind the RL	2Understanding
CLO2	Understand the basics of probability and distribution functions	2Understanding
CLO3	Understand Bellman equations for MRPs	2Understanding 3Applying
CLO4	Applying RL for real-world problems	3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M	M	H	M	H	M					L	M	H	M		
CLO2	M	M			L	L					L	L	M	L		
CLO3	M	M		L	M	M					L		M	L		
CLO4	H	M	M	L	M	H					M	M	H	M		

H:High,M:Medium,L:Low