# Panipat Institute of Engineering & Technology
## Department of CSE-AI&DS
### LESSON PLAN

**Subject:  Reinforcement Learning**                    **Subject code: PC-CS-AIDS-402A**

**Semester: VIII**

| SNo | Topic | CO Covered | Assignment No. | Teaching Methodology |
|-----|-------|------------|----------------|----------------------|
| 1 | Origin and history of Reinforcement Learning research | CO1 | Assignment no.-1 | Board |
| 2 | Its connections with other related fields | | | Board |
| 3 | different branches of machine learning. | | | PPT |
| 4 | The Reinforcement Learning Process | | | PPT |
| 5 | Elements of Reinforcement Learning | | | PPT |
| 6 | RL Agent Taxonomy | | | Board |
| 7 | Reinforcement Learning Problem. | | | Board |
| 8 | Introduction to RL terminology | CO2 | Assignment No. 2 | Board |
| 9 | Markov property, Markov chains | | | PPT |
| 10 | Markov reward process | | | PPT |
| 11 | Introduction to and proof of Bellman equations for MRPs along with proof of existence of solution to Bellman equations in MRP | | | Board |
| 12 | Introduction to Markov decision process (MDP) | | | PPT |
| 13 | state and action value functions, | | | Board |
| 14 | Bellman expectation equations | | | PPT |
| 15 | optimality of value functions and policies, | | | PPT |
| 16 | Bellman optimality equations. | | | PPT |
| 17 | Overview of Monte Carlo methods for model free RL | CO3 | Assignment No. 3 | Board |
| 18 | First visit and every visit Monte Carlo, | | | Board |
| 19 | Monte Carlo control, | | | PPT |
| 20 | On policy and off policy learning, Importance sampling. | | | PPT |
| 21 | TD Methods Incremental Monte Carlo | | | Board |

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| 22 | Methods for Model Free Prediction, Overview TD(0), | | | Board |
| 23 | Overview TD (1) and TD($\lambda$) | | | Board |
| 24 | k-step estimators, unified view of DP | | | PPT |
| 25 | MC and TD evaluation methods | | | Board |
| 26 | TD Control methods - SARSA, | | | Board |
| 27 | Q-Learning and their variants | | | PPT |
| 28 | Getting started with the function approximation methods | CO4 | Assignment No. 4 | Board |
| 29 | Revisiting risk minimization | | | Board |
| 30 | gradient descent from Machine Learning | | | PPT |
| 31 | Gradient MC and Semi-gradient TD (0) algorithms, | | | PPT |
| 32 | Eligibility trace for function approximation, Afterstates | | | Board |
| 33 | Control with function approximation | | | Board |
| 34 | least squares | | | PPT |
| 35 | Experience replay in deep Q-Networks | | | PPT |