ONLINE COURSE ON
REINFORCEMENT LEARNING (3:0)

APPLY NOW

INDIAN INSTITUTE OF SCIENCE
CENTRE FOR CONTINUING EDUCATION
CCE-PROFICIENCE COURSE (MAY – JULY 2026)

Prof. Shalabh Bhatnagar
Department of Computer Science and Automation, IISc

Saturdays 2 P.M. to 5:30 P.M.

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Objectives of the Course

Reinforcement learning refers to a class of techniques that combine aspects of optimal control, simulation/data driven optimization, and approximation methods for problems of dynamic decision making under uncertainty when the model of the underlying system and its processes is unknown. A large portion of the algorithms and techniques used here are model-free in nature and as a result need no knowledge of the system dynamics and protocols used. Reinforcement Learning thus finds applications in several diverse areas such as Adaptive Control, Signal Processing, Manufacturing, Communication and Wireless Networks, Autonomous Systems and Data Mining. The objective of this course will be to provide a strong foundation in Reinforcement Learning through the various tools, techniques and algorithms used as well as to cover the state-of-the-art algorithms in Deep Reinforcement Learning involving simulation-based neural network methods.

Syllabus

Introduction to Reinforcement Learning, Multi-armed bandits, Markov decision processes, Dynamic Programming Value and Policy Iteration Methods, Model-Free Learning Approaches, Monte-Carlo Methods, Temporal Difference Learning, Q-learning, SARSA, Double Q-learning, Value Function Approximation Methods TD Learning with Linear Function Approximation, Neural Network Architectures, Deep Q-Network Algorithm, Policy Gradient Methods, ActorCritic Algorithms.

Minimum Qualification

B.Tech (any discipline); B.Sc in Mathematics / Statistics /Computer Science / Physics / Data Science.

Syllabus for the Reinforcement Learning:

Week 1-Introduction to Reinforcement Learning – examples and applications

Week 2-Multi-armed Bandits – action selection strategies

Week 3-Multi-armed Bandits – algorithms; Introduction to Markov Decision Processes

Week 4-Markov Decision Processes – Examples, formulations

Week 5-Numerical approaches for Markov Decision Processes

Week 6-Monte-Carlo model-free Reinforcement Learning Algorithms for prediction

Week 7-Monte-Carlo Algorithms for Control; Temporal Difference Methods

Week 8-One and n-Step Temporal Difference Learning, Q-learning, SARSA, Expected SARSA, Double Q-learning

Week 9-Function Approximation Methods, TD Learning/SARSA with Linear Function Approximation

Week 10-Neural network architectures, Deep Q-learning

Week 11-Introduction to policy gradient methods – basic principles and results

Week 12 Policy gradient algorithms – REINFORCE, Actor-Critic