

# ECE 562 Robot Learning - Lecture Topics

Fall 2026

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| Assn.   | Lecture | Topics                                                                                                                                    | Date       | Category                     |
|---------|---------|-------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------|
|         | 1       | Introduction: Overview of Robot Learning Methods                                                                                          | 01-09-2026 | Intro                        |
| Assn. 1 | 2       | RL Basics I: Components of an MDP and an RL Agent, Value Functions, Bellman Optimality Equation                                           | 03-09-2026 | RL Basics                    |
|         | 3       | RL Basics II: Categories of RL Methods, RL Study Roadmap, Special Considerations of RL in Robotics, and History of Robotic RL Research    | 08-09-2026 |                              |
|         | 4       | ML Basics I: Mathematical Foundations and Stochastic Optimization                                                                         | 10-09-2026 | ML Basics                    |
|         | 5       | ML Basics II: Neural Networks, Backpropagation, and Loss Functions                                                                        | 15-09-2026 |                              |
| Assn. 2 | 6       | Policy Gradient Methods I: Overview of Policy Search, Policy Parameterization, Policy Gradient Theorem, REINFORCE Algorithm               | 17-09-2026 | Policy Gradient Methods      |
|         | 7       | Policy Gradient Methods II: Variance Reduction, Off-Policy Version of the Policy Gradient Estimator                                       | 22-09-2026 |                              |
|         | 8       | Policy Gradient Methods III: Trust Region Policy Optimization (TRPO), Proximal Policy Optimization (PPO), Guided Policy Search (Optional) | 24-09-2026 |                              |
|         | 9       | Value-Based RL I: Q-Learning, Double Q-Learning, Deep Q-Network (DQN), Double Deep Q-Network (Double DQN)                                 | 29-09-2026 | Value-Based RL               |
| Assn. 3 | 10      | Value-Based RL II: Prioritized Experience Replay (PER), Rainbow RL Algorithm                                                              | 01-10-2026 | Actor-Critic Methods         |
|         | 11      | Actor-Critic Methods I: Asynchronous Advantage Actor-Critic (A3C), A2C                                                                    | 06-10-2026 |                              |
|         | 12      | Actor-Critic Methods II: DPG, Deep Deterministic Policy Gradient (DDPG), Twin Delayed Deep Deterministic Policy Gradient (TD3) Algorithms | 08-10-2026 |                              |
|         | 13      | Actor-Critic Methods III: Maximum Entropy RL, Soft Q-Learning, Soft Actor-Critic (SAC) (a)                                                | 13-10-2026 |                              |
| Assn. 4 | 14      | Actor-Critic Methods IV: Soft Actor-Critic (SAC) (b), Code Implementation of PPO and SAC (a)                                              | 15-10-2026 | Model-Based RL               |
|         | 15      | Actor-Critic Methods V: Code Implementation of PPO and SAC (b), Assignments 3 & 4                                                         | 20-10-2026 |                              |
|         | 16      | Course Review I: Policy Gradient Methods, Value-Based RL Methods, Actor-Critic Methods                                                    | 22-10-2026 | Course Review I              |
|         | 17      | Model-Based RL I: Overview of MBRL Methods, MBRL vs. MFRL, Dyna and Dyna-Q Algorithms, PlaNet, Dreamer Algorithms                         | 27-10-2026 |                              |
| Assn. 5 | 18      | Model-Based RL II: Trade-Off Between MBRL and MFRL, Successor Representations and Successor Features, Fast RL (GPE/GPI) (Optional)        | 29-10-2026 | IRL                          |
|         | 19      | Inverse Reinforcement Learning and Interactive Imitation Learning I                                                                       | 03-11-2026 |                              |
|         | 20      | Inverse Reinforcement Learning and Interactive Imitation Learning II                                                                      | 05-11-2026 |                              |
|         | 21      | Temporal Abstraction Methods I: Semi-Markov Decision Processes (Semi-MDP), Options, and Skills                                            | 17-11-2026 | Temporal Abstraction Methods |
| Assn. 6 | 22      | Temporal Abstraction Methods II: Option-Critic Algorithm, Skill Discovery, and the ‘Alberta Plan’                                         | 19-11-2026 | Continual RL                 |
|         | 23      | Continual RL I: Task Generalization, Transfer Learning, and Meta-Learning                                                                 | 24-11-2026 |                              |
|         | 24      | Continual RL II: Catastrophic Forgetting and Learning Plasticity                                                                          | 26-11-2026 |                              |
|         | 25      | Continual RL III: A Mathematical Definition of CRL                                                                                        | 01-12-2026 |                              |
|         | 26      | Closing: Course Review II and ‘The Bitter Lesson’                                                                                         | 03-12-2026 | Closing                      |

Assn. 1: MDP Basics (6%) | Assn. 2: PPO I (10%) | Assn. 3: PPO II (10%) | Assn. 4: SAC (10%) | Assn. 5: SF and IRL (10%) | Assn. 6: CRL Paper Reading (4%)

No classes during Fall Reading Week (November 9-13, 2026). Assignment groupings indicate assessed content; release and due dates are posted separately in Canvas.