

Total Course Duration: 600 Hours

Semester 1

1. Introduction to Robotics (30 Hours)

- **History of Robotics** (5 Hours)
 - Evolution of robotics
 - Milestones in robotics development
 - **Types of Robots** (10 Hours)
 - Industrial robots
 - Service robots
 - Mobile robots
 - **Applications of Robotics** (15 Hours)
 - Manufacturing
 - Healthcare
 - Defense and exploration
-

2. Robotics Kinematics (40 Hours)

- **Forward Kinematics** (10 Hours)
 - Denavit-Hartenberg parameters
 - **Inverse Kinematics** (15 Hours)
 - Analytical vs. numerical methods
 - **Homogeneous Transformation** (5 Hours)
 - **Jacobians and Motion Analysis** (10 Hours)
 - Velocity and acceleration analysis
-

3. Robot Dynamics (40 Hours)

- **Newton-Euler Method** (15 Hours)
 - **Lagrangian Dynamics** (15 Hours)
 - **Dynamic Modeling of Robots** (10 Hours)
-

4. Control Systems (40 Hours)

- **Control Theory Basics** (10 Hours)
 - Open-loop vs. closed-loop control

- **PID Control** (15 Hours)
 - Tuning and implementation
 - **Advanced Control Techniques** (15 Hours)
 - Fuzzy logic control
 - Adaptive control
-

5. Sensors and Actuators (40 Hours)

- **Types of Sensors** (20 Hours)
 - Proximity sensors
 - Vision sensors
 - LIDAR and IMU
 - **Actuator Technologies** (10 Hours)
 - Motors and servos
 - **Sensor Fusion Techniques** (10 Hours)
 - Kalman filtering
-

6. Programming for Robotics (30 Hours)

- **Introduction to ROS** (10 Hours)
 - **Programming in Python/C++** (10 Hours)
 - **Simulation Tools** (10 Hours)
 - Gazebo and Webots
-

Semester 2

7. Mobile Robotics (40 Hours)

- **Navigation and Path Planning** (15 Hours)
 - A* and Dijkstra's algorithms
 - **SLAM Techniques** (15 Hours)
 - Mapping and localization
 - **Obstacle Avoidance Techniques** (10 Hours)
-

8. Robot Vision (40 Hours)

- **Image Processing Basics** (10 Hours)
 - Filters and transformations

- **Computer Vision Algorithms** (20 Hours)
 - Feature detection and tracking
 - **Machine Learning for Vision Systems** (10 Hours)
-

9. Human-Robot Interaction (30 Hours)

- **HRI Fundamentals** (10 Hours)
 - **Designing User Interfaces** (10 Hours)
 - **Ethical Considerations in Robotics** (10 Hours)
-

10. Advanced Robotics Topics (40 Hours)

- **Swarm Robotics** (15 Hours)
 - **Humanoid Robotics** (15 Hours)
 - **Autonomous Systems** (10 Hours)
-

11. Project Work (60 Hours)

- **Capstone Project** (50 Hours)
 - Design and implementation of a robotics project
 - **Team Collaboration and Presentation** (10 Hours)
 - Presenting project findings
-

12. Industry Applications and Trends (30 Hours)

- **Robotics in Industry 4.0** (10 Hours)
 - **Future Trends in Robotics** (10 Hours)
 - **Case Studies** (10 Hours)
-

Additional Components

- **Workshops/Seminars** (20 Hours)
 - Hands-on sessions with industry experts.
- **Internship** (Optional, 80 Hours)
 - Practical experience in a robotics-related job or project.
- **Assessment** (20 Hours)

ROBOTICS PG DIPLOMA COURSE

- Quizzes, assignments, and final exams.

Summary of Course Hours

- **Total Classroom Hours:** 540 Hours
- **Additional Components:** 60 Hours
- **Total Course Duration:** 600 Hours