iMSD

Robotics Course Core Components

INSTITUTE MEDIA STRATEGY DESIGN

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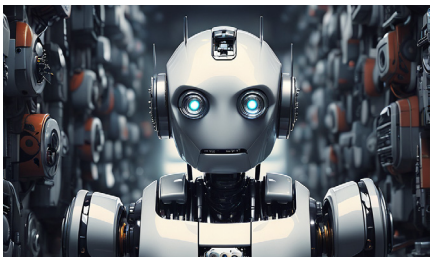

Duration: 3 Days

Related Courses:
Phython, C++, MATLAB, Java, C#, Lisp, Pascal, Scratch,

Course Overview and Objectives
This course provides a comprehensive introduction to the field of robotics, exploring the fundamental principles, technologies, and applications.

This course will learn about the design, control, and programming of robotic systems and gain practical experience through hands-on projects. The course emphasizes the integration of mechanical design, control theory, sensor technologies, and software to create functional robots.

Pre-requisites:
Basic knowledge of mathematics (calculus and linear algebra) and programming (e.g., Python or C++) is recommended but not required.

Course Format:
Lectures, hands-on labs, assignments, and a final project.

Robotics Course Outline

Introduction to robotics
- History of Robotics
- Overview of Robotics Applications
- Ethical and Societal Implications

Robotic Systems and Components
- Basic Concepts and Terminology
- Types of Robots (Industrial, Mobile, Humanoid)
- Components of a Robotic System (Sensors, Actuators, Controllers)

Robotic Kinematics
- Forward and Inverse Kinematics
- Denavit-Hartenberg (DH) Parameters
- Homogeneous Transformation Matrices

Dynamics of Robots
- Newton-Euler Formulations
- Lagrangian Mechanics
- Trajectory Planning

Sensors in Robotics
- Types of Sensors
- Proximity.
- Vision.
- Touch.
- Sensor Calibration and Data Acquisition
- Sensor Fusion Techniques

Actuators and Motors
- Types of Actuators (DC Motors, Servos, Stepper Motors)
- Motor Control and Feedback Systems
- Power Electronics for Robotics

Introduction to Control Systems
- Open-loop and Closed-loop Control
- PID Controllers
- State-Space Representation

Advanced Control Techniques
- Adaptive and Robust Control
- Model Predictive Control (MPC)
- Nonlinear Control Systems

Robot Operating System (ROS)
- ROS Architecture and Basics
- ROS Nodes, Topics, and Services
- Simulation with Gazebo

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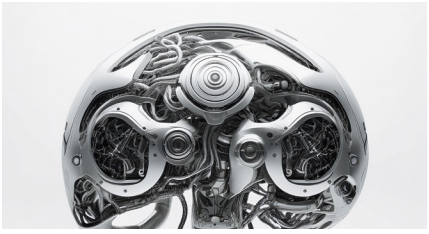
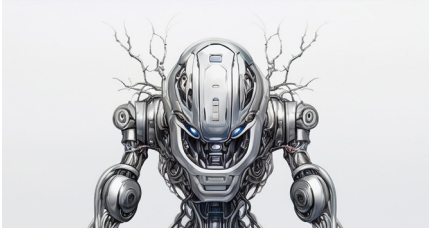
Design and analyze robotic Systems:
Explain the components of robotic systems, including sensors, actuators, and controllers



Programming
Write and debug code to control robotic systems using languages such as Python or C++. Utilize the Robot Operating System (ROS) for robot programming and simulation.



Design process is key
Establish workflows for collecting, analyzing, storyboarding and producing visual stories.

Robotics Programming

- Programming Languages (Python, C++)
- Writing and Debugging Code for Robots
- Integration with Hardware
- Hardware Description Languages (HDLs)

Computer Vision Basics

- Image Processing Techniques
- Feature Detection and Matching
- Object Recognition and Tracking

Advanced Perception Techniques

- 3D Vision and Depth Sensing
- SLAM (Simultaneous Localization and Mapping)
- Machine Learning for Perception

Introduction to AI and Machine Learning

- Basics of Machine Learning
- Neural Networks and Deep Learning
- AI Algorithms for Robotics

Application of AI in Robotics

- Path Planning and Navigation
- Reinforcement Learning
- Human-Robot Interaction

Robotics Project Development

- Project Proposal and Planning
- Design and Implementation
- Testing and Debugging

We offer online support to clients on content covered on our courses.