

Topics to be covered

Session 1: Foundations of Robotics and Intelligent Systems

- Introduction to Robotics: Types, Applications, and Trends
- Components: Sensors, Actuators, Controllers
- Overview of AI & ML in Robotics
- Case Studies: Industry 4.0 and Smart Automation
- ✦ *Demo: Arduino & Sensor Interfacing*

Session 2: Introduction to AI and ML Concepts for Robotics

- Supervised, Unsupervised, Reinforcement Learning
- Regression, Classification, Clustering Techniques
- Role of ML in Robotic Decision Making
- Neural Networks and Deep Learning Basics
- ✦ *Hands-on: Implementing ML Algorithms using Python (scikit-learn)*

Session 3: Perception Systems in Robotics

- Introduction to Computer Vision in Robotics
- Camera Models, Image Filtering, Edge Detection
- Object Detection: YOLO, SSD, Haar Cascades
- Sensor Fusion: LiDAR, IMU, and Cameras
- ✦ *Hands-on: OpenCV for Image Processing and Object Recognition*

Session 4: Machine Learning for Robotic Perception

- Training ML Models for Object Classification
- Feature Extraction and Data Annotation
- ML Pipelines for Real-Time Processing
- Integrating ML Models with Camera Feed
- ✦ *Hands-on: Image Classification with TensorFlow/Keras*

Session 5: Path Planning and Navigation

- Introduction to Navigation Algorithms: A*, Dijkstra
- Probabilistic Roadmaps and RRT
- SLAM (Simultaneous Localization and Mapping) Basics
- Static vs Dynamic Environment Planning
- ✦ *Hands-on: Path Planning using Python Simulators*

Session 6: Autonomous Control Systems

- Classical Control: PID, Feedforward Control
- Adaptive & Intelligent Control Systems
- Reinforcement Learning in Control
- Comparison of Model-Based vs Learning-Based Control
- ✦ *Simulation: PID Tuning and Adaptive Control in MATLAB*

Session 7: Robot Operating System (ROS) and Simulation Tools

- Introduction to ROS Architecture
- Nodes, Topics, Services, Launch Files
- Gazebo Simulator for Realistic Environments
- Integration with Perception and Control Modules
- ✦ *Hands-on: ROS + Gazebo-based TurtleBot Simulation*

Session 8: Deep Learning for Robotics

- CNNs for Visual Perception
- Recurrent Neural Networks for Sequence Tasks
- DL in Autonomous Vehicles and Mobile Robots
- Transfer Learning for Robotics Applications
- ✦ *Hands-on: Object Detection using YOLOv5 or TensorFlow Models*

Session 9: Human-Robot Interaction and Collaborative Robotics

- Basics of Human-Robot Interaction (HRI)
- Voice Recognition, Gesture Control, Emotion Detection
- Safety and Ethical AI in Robotics
- Collaborative Robots (Cobots) in Manufacturing
- ✦ *Demo: Voice-Controlled Robot or Gesture Recognition*

Session 10: Project-Based Learning and Innovation in AI-ML Robotics

- Design Thinking for Robotics Projects
- Building a Mini Project using AI-ML Concepts
- Innovation, IPR, and Startup Support in Robotics
- Proposal Writing for Research & Funding
- ✦ *Team Activity: Build & Present a Mini Robotic Solution*

Resource Persons

- Dr. Kavicharan Mummaneni, NIT-Silchar
- Dr. Nagamanikandan Govindan, IIIT-Hyd
- Mr. Kisshaan PSV, Anvi Robotics
- Mr. Pranav Kora, Anvi Robotics
- L. Manish Reddy, H-Bots Robotics
- Dr. G. Amarnath, MLRITM-Hyd.



COORDINATOR

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**AICTE Training and Learning Academy
(ATAL)**

Faculty Development Programme

on

**“AI & ML-Driven Robotics:
Perception, Planning, and
Autonomous Control System”**

Date: 28-07-2025 to 02-08-2025

Venue: AV Hall-MLRITM



Organizing by

Department of

Electronics and Communication Engineering

**MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY & MANAGEMENT**

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

NAAC Accredited Institution with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

www.mlritm.ac.in

About the College

Marri Laxman Reddy Institute of Technology and Management (MLRITM), established in 2009 in Hyderabad, Telangana, is a leading engineering college. Affiliated with Jawaharlal Nehru Technological University, Hyderabad (JNTUH), approved by AICTE, accredited by NAAC with 'A' Grade and accredited by NBA, it offers undergraduate and postgraduate programs in engineering and management. The campus features state-of-the-art laboratories, a well-stocked library, and sports facilities. MLRITM emphasizes research and development, encouraging innovative projects and industry collaboration. Its dedicated placement cell ensures strong recruitment outcomes with major companies. The institute also promotes holistic development through various clubs and extracurricular activities. Known for academic excellence, MLRITM consistently produces university toppers and maintains a robust alumni network.

About the Department

The Electronics and Communication Engineering (ECE) Department at Marri Laxman Reddy Institute of Technology and Management (MLRITM), established in 2009, offers a robust B.Tech program affiliated with Jawaharlal Nehru Technological University, Hyderabad (JNTUH). Accredited by the National Board of Accreditation (NBA), the department features state-of-the-art labs, including VLSI, Embedded Systems, and Digital Signal Processing Labs, providing practical, hands-on experience. The curriculum is regularly updated to include the latest technological advancements.

About The Programme

The one-week AICTE-ATAL Faculty Development Program (FDP) on "AI & ML-Driven Robotics: Perception, Planning, and Autonomous Control Systems" aims to equip faculty, researchers, and professionals with cutting-edge knowledge and practical insights into intelligent robotics. The FDP focuses on integrating Artificial Intelligence and Machine Learning in robotic systems to enhance perception, path planning, and autonomous control. Through expert-led sessions, hands-on tools like ROS, simulation platforms, and research-oriented discussions, participants will explore advanced methodologies shaping next-gen autonomous systems. This FDP fosters interdisciplinary learning, encourages research collaboration, and prepares educators to impart future-ready skills aligned with industry 4.0 and academic innovation.

Objectives of the Course

This FDP aims to provide a comprehensive understanding of robotics systems integrated with Artificial Intelligence and Machine Learning. It will equip faculty with knowledge of perception, planning, and autonomous control mechanisms in intelligent robots. The program intends to bridge the gap between theoretical foundations and practical applications using real-time tools like ROS, Python, and simulation environments. It also aims to foster innovation and research by enabling participants to guide student projects, pursue interdisciplinary collaborations, and integrate AI-ML-driven robotics into teaching, project mentoring, and research activities relevant to Industry 4.0 and beyond.

Important Dates

Last Date for Registration: 20-07-2025
Confirmation of Registration: 22-07-2025
Event Dates: 28-07-2025 to 02-08-2025

Outcomes

Participants will gain foundational and advanced knowledge in robotics integrated with AI and ML. They will be capable of designing intelligent robotic systems for real-time perception, motion planning, and autonomous control. The FDP will enhance their ability to develop research proposals, mentor innovative student projects, and integrate AI-driven automation into academic curricula. Exposure to tools like OpenCV, ROS, and machine learning libraries will prepare them to simulate and prototype intelligent robotic systems. By the end of the FDP, participants will be well-prepared to contribute to interdisciplinary research, innovation, and entrepreneurship in the field of AI-enabled robotics.

Targeted Participants

This programme is open to the faculty members of engineering colleges, research scholars and PG students. Also, industry personnel and who have involved with concerned/allied discipline can also attend.

Selection Criteria

The number of seats is limited to 50. ATAL FDPs are completely free for participants. Selection of the participants will be based on first come first serve and based on their area of research work.

Registration: **No registration fee.**

Registration has to be done only through <https://atalacademy.aicte-india.org/signup>
For more information <https://atalacademy.aicteindia.org/FAQs>

Certificate

Attendance will be monitored and **certificate** will be issued based on the minimum of 85% attendance and an average score of 60% in the test, as per **AICTE ATAL** guidelines.