

Applied Robotics & Product Prototyping

Module 1: Obstacle Avoider Robot (Autonomous Robotics Foundations)

Purpose

Introduce autonomous decision-making, real-time sensing, and motion control.

Technical Coverage

- Ultrasonic / IR distance sensing
- Motor drivers, DC motors, and PWM control
- Decision logic and real-time obstacle handling
- ESP32 / Arduino programming
- 3D-printed robotic chassis design

Outcome

- Fully autonomous obstacle-avoiding robotic car
- Understanding of sensor-based navigation and control loops

Module 2: Smart Dustbin (Automation & Human-Centric Design)

Purpose

Apply sensing and actuation to a socially relevant use case.

Technical Coverage

- Proximity sensing and servo actuation
- Event-based embedded programming
- Mechanical design for lid mechanism (3D printing)
- Optional data logging / usage counter

Outcome

- Touchless, automated smart dustbin prototype

Module 3: Automatic Pet Feeder (System-Level Embedded Design)

Purpose

Combine timing, mechanical reliability, and embedded control.

Technical Coverage

- Timed motor control and scheduling logic
- Hopper and dispensing mechanism design
- Power management and safety considerations
- Optional IoT-based scheduling and alerts

Outcome

- Functional automatic pet feeder with mechanical and electronic integration

Module 4: Robotic Arm (Advanced Mechatronics & Control)

Purpose

Capstone module integrating mechanics, electronics, and control.

Technical Coverage

- Multi-servo control and torque planning
- Joystick / programmed motion control
- Structural design using 3D printing
- Basic kinematics concepts

Outcome

- Multi-axis robotic arm with manual or semi-automatic control

Cross-Cutting Skill Integration (Across All Modules)

3D Printing

- CAD design of enclosures, chassis, and mechanical parts
- Iterative prototyping and assembly

PCB Design

- Schematic design and PCB layout for one selected module
- Power regulation, connectors, and IO planning