SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+'
Grade Approved by AICTE, New Delhi & Affiliated to Anna University,
Chennai

DEPARTMENT OF AEROSPACE ENGINEERING

19ASZ301– ROBOTICS & AUTOMATION IN SPACE

III YEAR VI SEM

UNIT 2 –INTRODUCTION TO ROBOTICS

TOPIC - ROBOT ANATOMY & CONFIGURATIONS

ROBOT ANATOMY

Robot Anatomy (Structure & Components)
Just like a human body, a robot has various components (organs) that allow it to sense, think, and act.

📌 **1. Manipulator (Arm)**
- Composed of links and joints
- Provides mechanical movement
- Mimics a human arm (shoulder, elbow, wrist)
- Enables degrees of freedom (DOF)

📌 **2. End Effector**
- The tool attached to the robot's wrist
- Examples: Gripper, welding torch, suction cup, paint spray gun
- Designed to interact with the environment

📌 **3. Actuators**
- Devices that create motion (muscles of the robot)
- Types: Electric motors, hydraulic cylinders, pneumatic actuators

📌 **4. Sensors**
- Provide feedback about the robot's environment or internal state
- Types:
  - Vision sensors (cameras)
  - Proximity sensors
  - Force/torque sensors
  - Encoders (position feedback)

📌 **5. Controller**
- The brain of the robot
- Executes the program, processes inputs, and sends commands to actuators
- Communicates with external systems (e.g., PLCs, computers)

📌 **6. Power Supply**
- Provides energy to the actuators and controller
- Types: Battery, electric mains, pneumatic/hydraulic pressure

ROBOTS CONFIGURATIONS

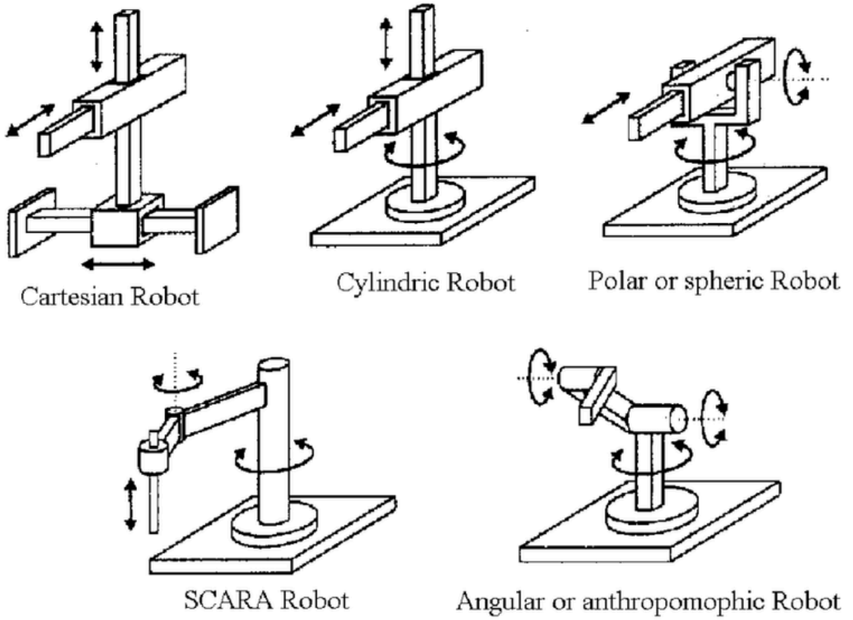
Configuration	Description	Example Use
🧱 Cartesian (XYZ)	Three linear axes (X, Y, Z)	CNC machines, 3D printers
🔁 Cylindrical	Rotational base + linear Z and Y	Assembly operations
📏 SCARA (Selective Compliance Articulated Robot Arm)	2 rotational + 1 vertical linear axis	Pick-and-place, small parts assembly
🔗 Articulated	Multiple rotary joints (like a human arm)	Welding, painting, assembly
⚙️ Polar (Spherical)	Rotational base, shoulder, elbow joints with radial arm	Arc welding, die casting
🚜 Delta	Parallel arms connected to a fixed base	High-speed pick-and-place (food, electronics)

DIAGRAMS

Manipulator: This is similar to a human arm that has different joints and flexibility

Endeffector: The End effector represents the palm and fingers of a human, meaning it can firmly grasp and manipulate objects in the more advanced robotic arms

The Locomotor: in a human, muscles control the movement. In a Robotic, arm motors control the movement with Electric, either Hydraulic or Pneumatic energy resources.




Thank You