SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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Chennai

DEPARTMENT OF AEROSPACE ENGINEERING

19ASZ301– ROBOTICS & AUTOMATION IN SPACE

III YEAR VI SEM

UNIT 3 –MOTION CONTROL AUTOMATION

TOPIC - MOTION COMPONENTS

COMPONENTS OF ROBOTS

Key Motion Components in Robotics

1. Actuators
2. Transmissions
3. Bearings and Guides
4. Feedback Devices
5. Controllers and Drives
6. Couplings and Joints

Actuators (Primary Movers)

- **The actuator converts electrical/hydraulic/pneumatic energy into motion.**

Type	Description	Application
🌀 Servo Motors	Precise, closed-loop control	Industrial arms, CNC
🔁 Stepper Motors	Open-loop, accurate steps	3D printers, pick & place
⚡ BLDC/Brushed DC Motors	High efficiency, speed	Mobile robots, drones
💧 Hydraulic Cylinders	High force	Heavy-duty robots
💨 Pneumatic Cylinders	Fast, simple	Grippers, clamping

COMPONENTS OF ROBOTS

Transmissions (Power Transfer)
These components transfer power from motors to robot links and joints.

Type	Description	Use Case
⚙️ Gearboxes (Planetary, Harmonic)	Speed reduction, torque amplification	Articulated arms
🔗 Timing Belts/Chains	Flexible, low cost	Mobile bases, conveyors
⚙️ Rack and Pinion	Linear motion from rotation	Linear robots
🌀 Ball Screws/Lead Screws	High-precision linear drive	CNCs, XYZ stages

Bearings and Linear Guides

Type	Function	Common Use
🧲 Ball Bearings	Rotary support	All joints
🛤️ Linear Rails (LM Guides)	Linear guidance	Cartesian/SCARA
⚙️ Cross Roller Bearings	High precision, compact	Wrist joints, rotary tables

COMPONENTS OF ROBOTS

Feedback Devices

Sensor	Output	Use
📏 Encoders (Rotary/Linear)	Position/speed	Motors, axes
📐 Resolvers	Angle measurement	Harsh environments
🧲 Hall Sensors	Commutation + speed	BLDC motors
👁️ Vision Systems	Position/orientation	Pick and place, inspection

Controllers and Drives

Component	Role
🧠 Motion Controller	Command generator (path planning, trajectory)
⚡ Servo Drive / Amplifier	Supplies power to motor, interprets control signals

Coupling Type	Use
Flexible Couplings	Reduce backlash, absorb shock
Oldham/Beam Couplings	Precise motion transmission
Rotary Joints	Allow movement between links (shoulder, elbow, wrist)


Thank You