

**RCETMECHCC03 – Robotics****Course outcomes:**

- Demonstrate knowledge of industrial robots, characteristics, end effectors and actuators.
- Apply spatial transformation to obtain forward and inverse kinematics
- Solve robot dynamics problems, generate joint trajectory for path planning
- Describe working principle of various sensors and program different operations
- Appreciate applications of robots in industry.

Syllabus:**UNIT I****BASIC CONCEPTS**

Brief history-Types of Robot–Technology-Robot classifications and specifications-Design and control issues- Various manipulators – Sensors - work cell - Programming languages.

UNIT II**DIRECT AND INVERSE KINEMATICS**

Mathematical representation of Robots - Position and orientation – Homogeneous transformation- Various joints- Representation using the DenavitHattenberg parameters -Degrees of freedom-Direct kinematics-Inverse kinematics- SCARA robots- Solvability – Solution methods-Closed form solution.

UNIT III**MANIPULATOR DIFFERENTIAL MOTION AND STATICS**

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist and armsingularity - Static analysis - Force and moment Balance.



UNIT IV

PATH PLANNING

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

UNIT V

DYNAMICS AND CONTROL

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulation

Reference Text Books

1. Fundamentals of Robotic Mechanical Systems - robots robotics