

Modern Robotics			
Hours/Week L-T-P :	3-0-0	Credits:	2
Course Type :	Advanced Competency Course	Course Code:	MS2107

Course Objectives:

- 1 To introduce definition, history of robotics and robot anatomy.
- 2 To learn the simulation of robot kinematics
- 3 To study the grasping and manipulation of robots.
- 4 To study about mobile robot and manipulation.
- 5 To study the applications of industrial, service, domestic robots.

Course Outcomes:

At the end of the course the students would be able to

CO1: Discuss the definition, history of robotics and robot anatomy.

CO2: Develop the simulation of robot kinematics

CO3: Describe the grasping and manipulation of robots.

CO4: Explain about mobile robot and manipulation.

UNIT I

10 hours

Robot: Definition, History of Robotics, Robot Anatomy, Co-ordinate systems, types and classification, Configuration space and degrees of freedom of rigid bodies and robots, Configuration space topology and representation; configuration and velocity constraints; task space and workspace, Rigid-body motions, rotation matrices, angular velocities, and exponential coordinates of rotation, Homogeneous transformation matrices.

Robot kinematics, Forward and inverse kinematics (two three four degrees of freedom), Forward and inverse kinematics of velocity, Homogeneous transformation matrices, translation and rotation matrices Denavit and Hartenberg (D-H) transformation, Dynamics of Open Chains, Trajectory Generation, motion planning, robot control: First- and second-order linear error dynamics, stability of a feedback control system.

UNIT-II

9 Hours

Kinematics of contact, contact types (rolling, sliding, and breaking), graphical methods for representing kinematic constraints in the plane, and form-closure grasping, Coulomb friction, friction cones, graphical methods for representing forces and torques in the plane, End effectors, grippers, types of gripper, gripper force analysis, and examples of manipulation and grasping.

UNIT-III

9 Hours

Mobile robot, Wheeled Mobile Robots: Kinematic models of omnidirectional and non-holonomic wheeled mobile robots, Controllability, motion planning, feedback control of non-holonomic wheeled mobile robots; odometry for wheeled mobile robots; and mobile manipulation. Reference Trajectory generation, feed forward control

UNIT-IV

7 Hours

Application of robotic: industrial robots, Service robots, domestic and house hold robots, Medical robots, military robots, agricultural robots, space robots, Aerial robotics Role of robots in inspection, assembly, material handling, underwater, space and healthcare

TEXT BOOKS:

1. Modern Robotics: Mechanics, Planning, and Control, by Kevin M. Lynch, Frank C. Park, Cambridge University Press; 1st edition (25 May 2017), ISBN-10 : 110715
2. Modern Robotics: Mechanics, Systems and Control, by Julian Evans, Larsen and Keller Education (27 June 2019), ISBN-10 : 1641720751

REFERENCES:

1. Modern Robotics: Designs, Systems and Control, by Jared Kroff, Willford Press (18 June 2019) ISBN-10 : 1682856763
2. Advanced Technologies in Modern Robotic Applications, by Chenguang Yang, Hongbin Ma Mengyin Fu, Springer; Softcover reprint of the original 1st ed. 2016 edition (30 May 2018), ISBN-10 : 981109263X
3. Modern Robotics: Building Versatile Machines, by Harry Henderson, Facts On File Inc; Illustrated edition (1 August 2006), ISBN-10 : 0816057451
4. Artificial Intelligence for Robotics, by Francis X. Govers, Packt Publishing Limited; Standard Edition (30 August 2018), ISBN-10 : 1788835441
5. Modern Robotics Hardcover by Lauren Barrett (Editor), Murphy & Moore Publishing (1 March 2022), ISBN-10 : 1639873732

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	1	2	-	-	-	1	-	-	1	1	2	3
CO2	2	1	3	1	2	-	-	-	1	-	-	1	1	2	3
CO3	2	1	3	1	2	-	-	-	1	-	-	1	1	2	3
CO4	2	1	3	1	2	-	-	-	1	-	-	1	1	2	3