NIRMA UNIVERSITY
INSTITUTE OF TECHNOLOGY, SCHOOL OF ENGINEERING

(Open Elective)

L	T	P	C
2	0	2	3

Course Code	**2MEOE01**
Course Title	**Introduction to Robotics**

Course Outcomes(CO):

At the end of the course, students will able to-

1. understand the concept of robotic and its applications in engineering,
2. carryout the coordinate transformation with respect to robotic systems,
3. formulate the mathematical relations for forward and inverse kinematic analysis and trajectory generation of robotic manipulator,
4. determine forces at end effector and select the actuator and sensor for a robot in a specific job task.

Syllabus **Teaching hours: 30**

UNIT I **Robot technology** **06 hours**

Fundamentals of Robots: Introduction, fundamentals of robot technology, classification, applications, Systems overview of a robot, basic components, control system and components.

UNIT II **Robot motion analysis and control** **10 hours**

Robot arm kinematics, forward & inverse kinematics solutions, Trajectory design,

Introduction to robot arm dynamics, introduction to mobile robots.

UNIT III **Actuators and sensors in Robot** **06 hours**

AC/DC motors, stepper motors and servo motor, Internal sensors, Position, Velocity, Acceleration, Proximity sensors, Touch and Slip sensors, Force and Torque sensors, External sensors, contact and non contact type like Vision, ranging, laser, acoustic, tactile etc. sensor selection and control.

UNIT IV **Types of End Effectors and Design** **08 hours**

End effectors, Classification, Force analysis and Gripper design.

Self - Study	The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work: Laboratory work will be based on the above syllabus.

Suggested Readings:

1 Richard D. Klafter, Thomas A Chmielewski and Michael Negin, Robotics Engineering: An integrated approach, Prentice Hall

2 Mittal and Nagrath , Robotics & Control , Tata McGraw-Hill Publishing Company Ltd., New Delhi

3 John Craig , Introduction to Robotics, mechanics and control, Pearson Education, New Delhi

4 M.P. Groover, Mitchell Weiss, Roger N. Nagel & Nicholas Godfrey, Industrial Robotics. Tata McGraw Hill Education Pvt. Ltd

5 Ashitava Ghoshal, Robotics Fundamental Concepts & Analysis, Oxford University Press.

L=Lecture T= Tutorial P=Practical, C=Credit

w.e.f. academic year 2020-21 and onwards