

SCSA1207	FUNDAMENTALS OF ROBOTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of robotics and automation.
- To learn the basic configurations and performance of robot.
- To familiarize with the sensors, drive system, and control systems of a robot
- To design a robot work cell for an industrial application
- To understand the various applications of robots, justification, implementation and safety of robot
- To write programming for various robotic applications

UNIT 1 BASICS OF ROBOTICS**9Hrs.**

Introduction - Anatomy of Robot - Laws of robotics - Links and Joints of robot - Robot wrist - Configurations of robot - work volume - Spatial resolution - accuracy resolution - repeatability of robot - speed of motion - load carrying capacity - Drive Systems of Robot - Control system of Robot - Types of robot control - Robot motions Rotary to rotary motion, Rotary to linear motion, Harmonics drives

UNIT 2 ROBOT SENSORS AND END EFFECTORS**9Hrs.**

Robotic sensors and actuators - Robot actuation and feedback components - Power transmission system - Robot joint control design - Robot End effectors Types of End effectors - Mechanical gripper- types of gripper mechanism - gripper force analysis - other types of gripper - special purpose grippers - Tools – Degrees of Freedom - Selection and design of Grippers.

UNIT 3 ROBOT MECHANICS**9 Hrs.**

Robot kinematics: Introduction - Position representation - 2 DOF Arm in 2D - 3 DOF Arm in 2D - 4 DOF Arm in 3D - rigid motion & homogeneous transformation forward & inverse kinematics - trajectory planning - Wrist Orientation - Manipulator path control - Robot Dynamics: Robot Arm dynamics - configuration of a robot controller.

UNIT 4 WORK CELL DESIGN AND COMPUTER VISION SYSTEM**9 Hrs.**

Robot work cell design - Work cell types – Work cell Control - Factors to be considered for work cell design - Interlocks - Machine vision: - Sensing and Digitizing - Imaging Devices - Lighting Techniques - AD Converter - Image Processing - Date reduction - Segmentation - Thres-holding - Region Growing-Edge Detection - Feature extraction - Object recognition - Applications Inspection - Identification - Visual servicing and navigation - Training the vision.

UNIT 5 ROBOT PROGRAMMING**9 Hrs.**

Robot programming Methods - Methods of Defining Position - Motion Interpolation - Commands - Branching - Robot Languages Classification of robot language - Computer control and robot software - Val system and Languages - Application of robots - Process Applications - Material Loading and Unloading - Material handling - Robots for Assembly and Inspection

Max. 45 Hrs.**COURSE OUTCOMES**

- CO1** : Understand the basics of robotics and to choose the appropriate type of drive and sensor system
- CO2** : Select the appropriate type of tools and grippers for various applications
- CO3** - Design a robotic arm and to bring a controlled movement in the end effectors
- CO4** : Understand the concept of Computer vision system and to develop a machine vision system for inspection
- CO5** : Ability to design robot work cell and develop robots for real life situational problems and think creatively for solutions
- CO6** : Ability to write various robot programs for various applications

TEXT /REFERENCE BOOKS

1. Mikell P. Groover, Mitchel Weiss, Roger N. Nagel , Nicholas G. Odrey , Ashish Dutta, Industrial Robotics - Technology, Programming and Applications McGraw Hill (SIE) | 2nd Edition 2012
2. John J. Craig, Introduction to Robotics: Mechanics and Control, third edition, Pearson Prentice Hall 2004
3. Harry H. Poole, Fundamentals of Robotics Engineering Van Nostrand Reinhold, Springer 2012
4. Frank L. Lewis, Darren M.Dawson, Chaouki T.Abdallah, Robot Manipulator Control Theory and Practice Second Edition, Revised and Expanded 2004
5. R.D.Klafter, T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated Approach, Prentice Hall of India,

SCSA2204	APPLICATION BASED PROGRAMMING IN PYTHON	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To write application-based programs in python programming.
- To implement web application using Flask.
- To implement web framework using Django.
- To implement web scraping and audio processing using python libraries.
- To develop basic and advanced games using python libraries.

SUGGESTED LIST OF EXPERIMENTS

1. Rock, Paper & Scissors Game
2. Random Password Generator.
3. Guess The Number Game
4. Email Slicer with Python
5. Python program to check the validity of a Password
6. Python program to check is the website is live or not
7. Writing CSV files in Python
8. make simple calculator in python
9. Weather application using beautiful Soup and Request
10. Detection of face id using OpenCV
11. Game Programming:
 - a. Tic Tac Toe
 - b. Dots and Boxes
 - c. Snake and apple
12. Advanced Game Programming:
 - a. Adding image, scenery
 - b. Making moves
 - c. Turning and shooting
 - d. Badgers, Arrows, Collision
 - e. Adding Health meter, Clock
 - f. Adding music
13. Web Scraping using BeautifulSoup
14. Web Scraping using MechanicalSoup
15. Simple Audio Processing using Pyo

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1: Implement and develop application using python.
 CO2: Develop program for simple gaming applications
 CO3: Design basic and advanced games using python gaming libraries.
 CO4: Demonstrate web scraping using python beautifulsoup.
 CO5: Demonstrate web scraping using python mechanicalsoup.
 CO6: Design and process audio files using pyo python framework.