Course Code	Course Title	L	T	P	C
BCSE411L	Robotics and Automation	3	0	0	3
Pre-requisite	NIL	Syllabus Version			
		1.0			

Course Objectives

1. To introduce the parts, working aspects and types of robots.
2. To make the students familiar with machine operations and automation using robots.
3. To discuss the various domain applications and implementation of robot control systems.

Course Outcomes

At the end of the course the student will be able to

1. Explain the basic working concepts of robots and to understand the kinematics of robot.
2. Analyze the various sensors and drive mechanism in robot for automation.
3. Understand the basic control system concepts for robot-controlled engineering.
4. Able to classify the actuation system and select appropriate type for their application.
5. Able to understand about robots and its applications in automation field

Module:1	**Introduction to Robotics**	**5 hours**
Introduction to robotics - law of robotics - History of robotics - Types and components of a robot - Classification of robots		
Module:2	**End effectors**	**5 hours**
End Effectors: Types of end effectors - Mechanical Gripper: Gripper force analysis - Vacuum cup - Magnetic gripper - Special types of grippers		
Module:3	**Robot Kinematics**	**7 hours**
Kinematics systems: Definition of mechanisms and manipulators, social issues and safety. Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters.		
Module:4	**Sensors and Imaging System**	**8 hours**
Sensor: Contact and Proximity - Position, Velocity, Force - Tactile. Introduction to image processing– types of image dimensions - acquisition of images – Resolution and quantization of images - Vision system applications in robotics.		
Module:5	**Control system concepts for robotics**	**6 hours**
Closed-loop and open-loop control systems for robotics - Basics of control: Transfer functions - Non-linear and advanced controls.		
Module:6	**Actuation Systems**	**6 hours**
Actuators: Electric, Hydraulic and Pneumatic - Transmission: Gears - Timing Belts and Bearings - Parameters for selection of actuators		
Module:7	**Automation in robotics and its applications**	**6 hours**
Overview of automation: Architecture of automation and integration with sensors – actuators – components - Robot Applications in automation field like Machine loading, Pick and place operations, Inspection		
Module:8	**Recent Trends**	**2 hours**
Guest lectures from Industry and, Research and Development Organizations		
	Total Lecture hours:	**45 hours**

Text Book(s)			
1.	John J. Craig, "Introduction to Robotics Mechanics and Control", Pearson Education Limited 2022.		
2.	Saeed B. Niku, "Introduction to Robotics Analysis, Control, Applications", John Wiley & Sons Ltd 2020.		
Reference Books			
1.	Saha S.K., "Introduction to Robotics", 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.		
2.	Ghosal A., "Robotics", Oxford, New Delhi, 2006.		
Mode of Evaluation: CAT, written assignment, Quiz, FAT			
Recommended by Board of Studies	12-05-2023		
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