

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology			Branch/Spec.	Automobile Engineering				
Semester	VII			Version	1.0.0.0				
Effective from Academic Year		2020-21		Effective for the batch Admitted in			July 2017		
Subject code	2AE704PE1		Subject Name	Industrial Robotics and Automation					
Teaching scheme				Examination scheme (Marks)					
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE	SEE	Total	
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50
Pre-requisites:									
None									
Objectives of the Course:									
<ol style="list-style-type: none"> 1. To understand the working of robotics 2. To understand automation carried out in industries 3. To understand the functioning of robotics and automation in material handling processes in automobile industries. 									
Theory syllabus									
Unit	Content							Hrs.	
1	Introduction : Automation and robotics, Brief history of robotics, Development in robotics, Economics aspects of robots, Advantage and disadvantage of using robots in industries. Overview of robots – Present and future applications. Production Design for Robotic Assembly: Production design for robotic and automatic assembly, consideration for assembly oriented product design. Robot safety.							8	
2	Classification and structure of robotic system: Classification, Geometrical configurations, wrist and its motions, End effectors and its type, links and joints. Robot drive system: – Hydraulic, Electric and pneumatic drive system, Resolution, accuracy and repeatability, Advantage and disadvantage of drive system.							8	
3	Control system and components: Basic control system concept and models, Transfer function and block diagram of spring mass system, Controllers – proportional, proportional and integral, proportional and derivative, PID, transient and response to second order system. Robot actuation and Feedback component – position, velocity sensors.							8	
4	Robot arm kinematics: Introduction, Direct and inverse kinematics, rotation matrix, rotation matrix about an arbitrary axis, Homogeneous transformation, links, joint and their parameters, D-H representation. Trajectory Planning: Introduction, general consideration on trajectory planning, joint interpolated trajectory, planning of Cartesian path trajectories							8	
5	Robot programming and languages: Introduction, manual teaching, lead through teaching, programming language – AML and VAL, storing and operating, Task programs. Sensors: Internal state sensors, tactile sensor, proximity sensing, range sensing, force torque sensor, elements of computer vision, sensing and digitizing function in machine vision- sampling- quantization-encoding-image storage. Image processing and analysis, feature extraction and object recognition. Artificial intelligence							7	
6	Applications in Automobile: <u>Introduction to Automated, Connected, and Intelligent Vehicles:</u> Automotive Electronics Overview, History & Evolution. Infotainment, Body, Chassis, and Powertrain Electronics, Advanced Driver Assistance Electronic Systems. <u>Connected and Autonomous Vehicle Technology:</u> Basic Control System Theory applied to Automobiles, Overview of the Operation of ECUs, Basic Cyber-Physical System Theory and Autonomous Vehicles, Role of Surroundings Sensing Systems and Autonomy, Role of Wireless Data Networks and Autonomy							6	

	<u>Sensor Technology for Advanced Driver Assistance Systems:</u> Basics of Radar Technology and Systems, Ultrasonic Sonar Systems, Lidar Sensor Technology and Systems, Camera Technology and Night Vision Technology	
Practical content		
Practical assignments and tutorials are based on above syllabus.		
Text Books		
1	Automation, Robotics & CAD/CAM, Groover M.P., Pearson Education.	
2	Robotics Technology & Flexible Automation, Deb S.R., Tata McGraw Hill	
Reference Books		
1	Industrial Automation & Robotics, Gupta & Arora, Laxmi Publication.	
2	Robotic Control sensing vision & Control, Gonzalz K.S., Tata McGraw-Hill	
3	Industrial Robotics, Deb, Tata McGraw-Hill	
4	G. Mullett, Wireless Telecommunications Systems and Networks, Thomson – Delmar Learning, ISBN#1-4018-8659-0, 2006	
5	G. Mullett, Basic Telecommunications: The Physical Layer, Thomson – Delmar Learning, ISBN#1-4018-4339-5, 2003	
6	Robotics: Control Sensing, Vision & Intelligent, King Sun Fu, Tata McGraw Hill Education Asia	
ICT/ MOOCs references		
1	NIL	
Course Outcomes:		
After completion of this course, student will be able to		
<ol style="list-style-type: none"> 1. Basics of robotics in today and future goods production. 2. Principles of robot programming and handle with typical robot 3. Using and functioning of robots and usage it's for industrial purpose. 		