GOVERNMENT OF TAMILNADU
DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI
STATE PROJECT COORDINATION UNIT
(Established under Canada India Institutional Cooperation Project)
CURRICULUM

Course Name	**ROBOTICS IN INDUSTRIAL AUTOMATION**
Course Code	ME/2020/040
Course Duration	50 Hours
Minimum Eligibility Criteria	ITI/10th/+2/Diploma/Graduates
Pre-requisites (if any)	-
Course Objectives	Training module has been designed to provide the participants to • Understand the necessary definitions, Components in Robotics and different types of Robots • Know about hardware design aspects of Robot • Understand the programming concepts of Robot • Apply Block code programming to actuate the Robot
Course Outcomes	At the end of training, the participants will be able to • Execute the functioning of Robot. • Utilize different Robot applications for Industrial applications. • Use Debot Magician Robot for Robot arm application • Prepare a model using 3D printer using Robot arm
Expected Job Roles	Robot Service Technician /Automation Engineer

TEACHING AND SCHEME OF EXAMINATION						
Course Code	Course Name	Hours		Assessment Marks		Duration of Examination
				Min	Max	
ME/2020/041	**ROBOTICS IN INDUSTRIAL AUTOMATION**	Theory	25	10	20	3 Hours
		Practical	25	40	80	
		Total	50	50	100	

ME/2020/041 - ROBOTICS ININDUSTRIAL AUTOMATION

DETAILED SYLLABUS

Unit No.	Modules	No. of Hours	
		Theory	Practical
I	**Robotics Introduction and Hardware design**	**14 Hours**	
1.1	Robotics Introduction Introduction – Definition, Robot Elements – links, joints, end effector, actuator, coordinates, Orientation of axis and movement – Pitch, Roll, Yaw, Types of industrial robots - Articulated robots, Cartesian robots, SCARA robots, delta robots, polar robots and cylindrical robots - introduction on robots	04	
1.2	Hardware design Introduction Sensing elements in robot – Accelerometer, limit switches, rotary encoders, Types of motors used in Industrial robots – stepper motor, servomotor, micro stepping, driving methods , Types of end effectors – gripper, suction , vision sensors - DOBOT - an overview, Architecture, Getting started	04	
1.3	**Practical:** ➢ Different types of sensors ➢ Different types of actuators ➢ Micro stepping of DC motor ➢ vision using ultrasonic sensor ➢ Exploring DOBOT magician and its components ➢ Exploring DOBOT Studio driver installation and getting started		06
II	**Programming concepts**	**10 Hours**	
2.1	View–Based teaching/Recording Concept, Getting started with robot programming, Description of robotic movement – Point to Point movement – JUMP, MOVJ, MOVEL , Speed, Acceleration co-ordinate-Cartesian co-ordinate, polar Co-ordinate, Homing, looping, repeatability, collusion detection, position detection	04	
2.2	**Practical:** ➢ Exploring 3 dimension Co-ordinates concepts ➢ Implementation of teach and playback concepts ➢ Implementing PTP movement using jump, MOVJ, MOVEL ➢ Implementing polar, Cartesian co-ordinate system using PTP movement ➢ Getting started with blocky code programming		06
III	**Blocky code Programming**	**10 Hours**	
3.1	Introduction - blocky commands – logical manipulation, controlloop structure, Conditional Statement, math logics, functiondeclaration, variable declaration, Programming concepts using API - Basic, Kinematic configuration, move, I/O configuration, Application control using Input/Output, Sensor control	04	

3.2	**Practical:** ➢ Implementation of logic manipulation using blocky code ➢ Implementation of control loop structure using blocky code ➢ Implementation of function declaration using blocky code ➢ Implementation of API using blocky codes ➢ Implementation of stacking using teach/playback and blocky code concept		06
IV	**Writing / 3D printing, Arduino Based Robot Arm and Application of Robots**	**16 Hours**	
4.1	Writing / 3D printing Introduction – Writing/3D printing, Getting started with Writing, Importing Image, Configuration Parameter, Concepts of "followtrack", "Point into line", "playback path ", getting started with 3D printing, I/O configuration	04	
4.2	Arduino Based Robot Arm Introduction – Arduino, Hardware design guide, Robot assembling, programming concepts	03	
4.3	Application of Robots	02	
4.4	**Practical:** ➢ Implementation of convey control mode using I/O configuration ➢ Getting started with Robot writing ➢ Implementation of Robot writing by importing images ➢ Implementation of pick and place using 6 axis robot ➢ Implementation of stacking using 6 axis robot		07
	Total Theory and Practical hours	**25**	**25**
	Total hours	**50**	

HARDWARE REQUIREMENT

S. NO.	LIST OF TOOLS / EQUIPMENTS
1.	Windows 8 or 10 based computer systems
2.	Debot Magician Robot
3.	Arduino based Robot

SOFTWARE REQUIREMENT

S. NO.	LIST OF SOFTWARE
1.	The software to operate the Debot Magician Robot will come along with the Robot

REFERENCE BOOKS

S. NO.	NAME OF THE BOOK	AUTHOR	PUBLISHER
01	Robotics and Industrial Automation	Rajput.R.K	S.CHAND

ASSESSMENT AND CERTIFICATION

S. No.	Criteria for Assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.
6.	On successful completion of training, Certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

END EXAMINATION

ALLOCATION OF MARKS

S.NO	Description	Max.Marks
1.	Theory Examination	20
2.	Practical Examination	
	a)Aim and Procedure	20
	b)Demonstration / Execution	25
	c) Result & Viva Voce	15
	d)Record	20
	Total Marks	**100**

THEORY MODEL QUESTION PAPER

ME/2020/040 – ROBOTICS IN INDUSTRIAL AUTOMATION

(Maximum Marks: 20)

(N.B: Answer any **Twenty** questions) **20x1= 20 Marks**

1. What is Robot?
2. Which was the first industrial Robot?
3. What are the components of Robot?
4. What is mean actuators of the Robots?
5. Mention the types of motor used in industry Robot.
6. List the types of end effectors.
7. What are the various types of the sensors used in Robot?
8. Expand DOBOT.
9. Name the basic unit of a Robot which can be programmed to give instruction to the ROBOT.
10. Write the function of JUMP.
11. What is meant by looping?
12. Write the function of MOVJ.
13. Define point to point movement.
14. What is meant by homing?
15. Write any two blocky commands.
16. Name any two conditional statements.
17. Write Kinematic configuration.
18. How does 3D Printing works?
19. Write any two example of 3D Printing.
20. Define follow track.
21. What is playback path?
22. Name any two types of Arduino.
23. What is meant by Robot assembling?
24. Write any two application of Robot.
25. Do Arduino provides IDE environment