

Robotics and Digitalization in Manufacturing

Program Description

Course Name	Robotics and Digitalization in Manufacturing
Course Name as on Certificate	Certification in Robotics and Digitalization in Manufacturing
Certificate Type	Certificate of Completion by IITM Pravartak and L&T EduTech
Certificate Issued by	IIT MADRAS and L&T EduTech
Course Description	<p>The primary goal of this course is to teach students about the nuances of industrial automation and how it can be applied through digitalization. This course is distinguished by its comprehensive coverage of various robotic configurations for industrial applications, robot design specifications, application-oriented robot programming, and robotic vision systems. It improves the learners' ability to design and build Robots for specific applications.</p> <p>Digitalization is unavoidable in today's world. Industry 4.0 is critical for integrating manufacturing and business as a whole in order to reduce complexity and decision making. From digital twins to robotic process automation, this course gives insight into the concepts of smart factories and digital transformation. The applications of Product Life Management, ERP, Value Chain Management, and IIoT in industries are thoroughly discussed.</p> <p>Enables learner to:</p> <ul style="list-style-type: none"> • Associate with various Robotic configurations and Robotic programming features • Interpret the vital components of Mechatronics systems, Robotic Design aspects, and Interfacing • Illustrate the theoretical aspects of Digital Manufacturing • Design Robots for Industrial applications • Summarize the technical impact of Digital Manufacturing •
Educational Qualification	<ul style="list-style-type: none"> • Students pursuing Diploma / UG / PG Programs in Mechanical and other allied domains • Faculties in the field of Mechanical and other allied domains • Working professionals in the above domains
Pre Requisites	Basics of Industrial Manufacturing, Introductory Mechatronics and Robotics
Course Content	See Enclosed Programme details – as Annexure 1
Pedagogy	Online Self paced E-Learning Content
Assessment	One Final Assessment
Programme Faculty	<ol style="list-style-type: none"> 1. Dr Venkatesh Radhakrishnan, Subject Matter Expert – L&T EduTech Having more than 23 years of teaching experience in subjects related to manufacturing and material science, he is currently a Subject Matter Expert at L&T EduTech. Served as a Production & Quality Assurance Engineer, with his expertise in designing the jigs and fixtures for complicated structural support systems. Associated with several research-related projects funded by AICTE, NRB, MODROBS, etc. 2. Dr. J Bhaskaran, Subject Matter Expert – L&T EduTech A Mechanical Engineering Subject Matter Expert at L&T EduTech, has 30 years of teaching and Industry experience in India and Abroad. He has a PhD in Metal Cutting- Precision Manufacturing /Mechanical Engineering from Anna University

	<p>and is an experienced educator. He has published 20 papers in Scopus-indexed journals. He has been appointed as a Research Supervisor at Anna University for MS and PhD students. He is currently working on Digital Manufacturing and Automation topics. Throughout his career, Dr. Bhaskaran has taught technical classes to industrial executives at prestigious companies such as L&T, Ford India Ltd, Apollo Tyres, and others. He is a member of the Indian Society for Technical Education and the Society of Automobile Engineering (USA). During his tenure as Professor and Head of Mechanical Engineering at an Anna University affiliated college, the Mechanical Engineering Department was re-accredited two times (NBA-new Tier-II -Washington accords).</p>		
Duration	Weeks: 14 ; Hours : 28		
Class Schedule	Self Paced		
Programme Highlights/USPs	<p>Sensor & Transducers in Machine tools & robots Electrical, Hydraulic & Pneumatic actuators Servo systems Robotic Engineering Robot Programming Robot Vision systems Interfacing Simulation using Matlab Digital Transformations Cyber Physical Systems Digital Twins & Digital Thread Robotic Process Automation Industry 4.0 ERP & Value chain Management Smart Factory Additive Manufacturing IIoT Industrial Applications</p>		
Total Fees		Total Fees (Rs.)	
	Total Programme Fee	Rs. 5,100/- inclusive of Tax	

ANNEXURE 1

Proposed Course outline / programme / plan - Unit wise syllabus details.

Unit-1**Servo engineering and Fluid systems in M/C tools & Robots**

Evolution of Mechatronics and its importance, Range of sensors from Domestic appliances to Machinery on the shop floor, Sensors in Machine tools, Sensors in e Robots, Standards & specifications of sensors, and Interfacing sensors in a CNC Machine for Tool life monitoring

Various electrical drives in powering different machine tools, Hydraulic actuators for heavy and light duty applications, Pneumatic actuators for Machine tools, Hydro Pneumatic Actuators

Essential Pneumatic and Hydraulic circuit components, Hydraulic and Pneumatic circuits for cascading operations in machine tools, Design of Electro- Hydro-Pneumatic Circuits, Fluidics and Logic circuits in Machine tools, and Trouble Shooting in the Drive system.

Unit -2**Robotics Engineering**

Robotic configurations, Robotic grippers with sensing capabilities, Robot Kinematics and Control, Mentoring the robots, Robot Programming relevant to Industrial applications, and Robotic Intelligence in Manufacturing.

Robotic Vision sensors, Frame Grabbing, Sensing and Digitizing, Image Processing, and Enhancement, Object recognition and Algorithms, and Automated Guided vehicles.

The material used in the Fabrication of a Robot, Selection and Design Criteria, Application-based Grippers and their design, Energy Supply to Robots, Robot communication, IoT in Robotics, Data Applications in Robot centered Manufacturing, and Applications of robots in various fields.

Unit-3**Digital Transformation Technology**

Evolution of conventional to Digital Manufacturing Practices, Digital Transformations, Drivers, 3D of Digital Manufacturing, Cyber-Physical systems, IIoT, Digital Twin, and Digital Thread, Challenges & Outcomes of Digital Manufacturing.

Origin and Development of Industry 4.0, Key components, Six design Principles, Architecture model, Digital resource Modelling and simulation, EPR and Value chain Management, and Validation & Virtual commissioning.

Computer Geometric Modelling, Types, and Kernels, Computer Aided Assembly Modelling, Kinematic, and Dynamic Modelling; Automation in Manufacturing Processes, Geometric Dimensioning, and Tolerancing (GD&T); Finite Element Analysis and Modelling Procedure, CAE -Implementation

Unit -4**Automation in Digital Manufacturing**

PLM- Elements in PLM and System Architecture, Digital Product Life Cycle, PLM Platform-Overview, Integration of Computer-aided technologies in PLM, Connectivity of ERP and PLM, Value Chain Management- Drivers of Digital Supply Chain Management, Value Analysis, Integration of Value Chain in Digital Manufacturing.

Robotic Process Automation, workflow Management, Machine health monitoring, Manufacturing analytics, Mobile applications, Additive Manufacturing Process Chain, Process selection, Post Processing, and software issues in Digital Manufacturing.

Micro Processors, Microcontrollers, and Programmable Logic Controllers. Mechatronics system design, Utilizing IoT in Mechatronics systems, Embedded systems and Role of Fuzzy logic in Manufacturing

Unit -5

IoT applications in Smart Factory

Introduction to Smart Factory, Cloud Computing strategies in Smart Factories, Cyber Security, Smart Energy Management, Track and Trace Technology, Remote Monitoring, Augmented reality, Horizontal & Vertical Integration Smart Logistics, and supply chain, Connected Factory in smart manufacturing, Predictive Maintenance, and Quality Management.

IoT & Applications-IoT Architecture, Layers of the IoT Architecture, Energy Monitoring in Casting & Forging Processes, Production monitoring in an Automotive Industry, Process monitoring, Overall monitoring of equipment for its effectiveness in performance, and Aerospace applications.