Course Outcomes (COs)

Department of

Mechanical Engineering

Programme Name : M.Tech.-Industrial Automation and Robotics

CONTENTS

SL NO	PARTICULARS	PAGE NO
1	2022 Scheme-First Courses	2
2	2022 Scheme- Second Year Courses	7
3	2020 Scheme- First Year Courses	8
4	2020 Scheme- Second Year Courses	13

M Tech in Industrial Automation and Robotics

Course Outcomes of First -Year Courses

Course Name	Applied Mathematics
Course Code	22MAR11
Course outcomes (COs): At the end of the course the student will be able to:	
22MAR11.1	Apply matrix and iterative methods to solve a system of linear algebraic equations.
22MAR11.2	Apply geometry of Linear transformations and construct orthonormal basis of an inner product space
22MAR11.3	Diagonalising a matrix by finding the eigenvalues and the corresponding eigenvectors, compute the smallest and the largest eigenvalues and also singular values.
22MAR11.4	Use statistical tools to draw inferences for the given data

Course Name	Computer Integrated Manufacturing
Course Code	22MAR12
Course outcomes (COs): At the end of the course the student will be able to:	
22MAR12.1	To impart the basic concepts in manufacturing systems and fundamentals of NC & CNC system
22MAR12.2	Knowledge enhancement in design consideration and increasing productivity with NC machine tools, machining centers and tooling for CNC machines
22MAR12.3	To enhance students' awareness in part programming and computer control in NC
22MAR12.4	To impart the basic concepts in Computerized Manufacturing Planning and Control Systems

Course Name	Agile Manufacturing
Course Code	22MAR13
Course outcomes (COs): At the end of the course the student will be able to:	
22MAR13.1	Explain the conceptual frame work of agile manufacturing environment
22MAR13.2	Apply the concepts of enterprise design process to develop agile manufacturing
22MAR13.3	Apply interdisciplinary design concepts to the production functions
22MAR13.4	Apply the principles of agility for supply chain management

Course Name	Drives and Control System in Automation
Course Code	22MIA14
Course outcomes (COs): At the end of the course the student will be able to:	
22MIA14.1	Describe and analyze working principles of various types of motors, differences, characteristics and selection criteria, control methods, SCADA
22MIA14.2	Apply the knowledge in selection of motors, heating effects and braking concepts in various industrial applications
22MIA14.3	Construct a program using PLC to problems pertaining to automation industries
22MIA14.4	To understand visualization systems and its integrations

Course Name	Sensors Applications in Manufacturing
Course Code	22MIA15
Course outcomes (COs): At the end of the course the student will be able to:	
22MIA15.1	Explain various signal condition devices used in electronic devises and use of appropriate method in signal conditions in various applications.
22MIA15.2	Describe impact of an RFID system on manufacturing, defense, distribution, retail & health sectors & abstract ("filter") information in RFID
22MIA15.3	Summaries the future advances to the quality and integrity of manufacturing and related sectors resulting from the use of RFID and other sensor
22MIA15.4	Analyze and choose appropriate sensors in different industrial applications.

Course Name	PLC and Sensors Laboratory
Course Code	22MIAL17
Course outcomes (COs): At the end of the course the student will be able to:	
22MIAL17.1	The students will be able to write and execute PLC ladder logic for different practical problems of automation
22MIAL17.2	Students will be able to analyze the suitability of different sensors for different operational requirements in automation
22MIAL17.3	Apply integration techniques of PLC ladder logic with sensor data by designing responsive automation systems.
22MIAL17.4	Diagnose and resolve issues in PLC-sensor systems, demonstrating proficiency in troubleshooting and maintaining automation setups.

Course Name	Robotics for Industrial Automation
Course Code	22 MAR21
Course outcomes (COs): At the end of the course the student will be able to:	
22MAR21.1	Explain basic components, drive systems, control systems and configurations of industrial Robots.
22MAR21.2	Explain various sensing, vision and teaching techniques of robotics systems.
22MAR21.3	Apply different robot teaching methods and programming techniques for various industrial applications.
22MAR21.4	Apply analytical techniques and basic principles of robotic design for solving the kinematics of a robot manipulator.

Course Name	Hydraulics and Pneumatics Control System
Course Code	22MIA22
Course outcomes (COs): At the end of the course the student will be able to:	
22MIA22.1	Study of working principle of various components used in hydraulic and pneumatic systems.
22MIA22.2	Select different components used in hydraulic and pneumatic systems.
22MIA22.3	Design of Hydraulic and Pneumatic circuits.
22MIA22.4	Understand industrial applications of hydraulic and pneumatic circuits.

Course Name	MINI PROJECT WITH SEMINAR
Course Code	22MTE25
Course outcomes (COs): At the end of the course the student will be able to:	
22MTE25.1	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information to apply these skills to the project task.
22MTE25.2	Habituated to critical thinking and use problem solving skills.
22MTE25.3	Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
22MTE25.4	Learn on their own, reflect on their learning and take appropriate actions to improve it.

Course Name	Automation and Robotics Laboratory
Course Code	22MIAL26
Course outcomes (COs): At the end of the course the student will be able to:	
22MIAL26.1	Simulate manufacturing processes before being put to actual machining
22MIAL26.2	Apply/develop solutions or to do research in the areas of Design and simulation in Mechanical Engineering.
22MIAL26.3	Program and control robot path for industrial applications.
22MIAL26.4	Analyze advanced automation and robotics concepts, showcasing a deep understanding of their applications in complex engineering contexts.

Course Outcomes of Second -Year Courses

Course Name	Artificial Intelligence in expert system Automation
Course Code	22MAR31
Course outcomes (COs): At the end of the course the student will be able to:	
22MAR31.1	Understand problem solving methods, state space problems and search methods.
22MAR31.2	Understand knowledge acquisition and representation methods.
22MAR31.3	Assess critically the techniques presented and apply them to real world problems.
22MAR31.4	Develop knowledge of decision making and learning methods.

Course Name	PROJECT WORK PHASE -2
Course Code	22MIA41
Course outcomes (COs): At the end of the course the student will be able to:	
22MIA41.1	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task
22MIA41.2	Habituated to critical thinking and use problem solving skills
22MIA41.3	Communicate effectively and to present ideas clearly and coherently in both the written and oral forms
22MIA41.4	Learn on their own, reflect on their learning and take appropriate actions to improve it.

Industrial Automation and Robotics- 2020 Scheme

Course Outcomes of First-Year Courses

Course Name	NUMERICAL METHODS FOR ENGINEERS
Course Code	20MCM11
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM11.1	Use the numerical methods for solving algebraic and transcendental equations which comes in mechanical engineering courses
20MCM11.2	Demonstrate common numerical methods and how they are used to obtain approximate solutions
20MCM11.3	Analyze and evaluate the accuracy of common numerical methods
20MCM11.4	Apply modern tools numerical methods to solve problems

Course Name	MECHATRONICS AND APPLICATIONS
Course Code	20MCM12
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM12.1	Identify and explain the architectures of 8085 and 8086 microprocessors. Describe the concept of segmentation
20MCM12.2	Interfacing with respect to memory and I/O. Discuss the application examples of stepper motor.
20MCM12.3	Understand the concept of Microcontroller and microprocessor and PIC architectures and core concepts.
20MCM12.4	Discuss about various assembly programming mechanics and explain various instructions used for Microcontroller assembly programing

Course Name	COMPUTER INTEGRATED MANUFACTURING SYSTEM
Course Code	20MCM13
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM13.1	Apply the concepts of machining for the purpose of selection of appropriate machining centers, machining parameters.
20MCM13.2	Create and demonstrate the technical documentation for design/ selection of suitable drive technologies, precision components and an overall CNC machine tool system for automation of machining operations
20MCM13.3	Create and validate NC part program data using manual data input (MDI) and automatically using standard commercial CAM package for manufacturing of required component.
20MCM13.4	Design automated material handling and storage systems for a typical production system and control the process

Course Name	CONTROL SYSTEM ENGINEERING
Course Code	20MCM14
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM14.1	Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form.
20MCM14.2	Characterize any system in Laplace domain to illustrate different specification of the system using transfer function concept
20MCM14.3	Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions and determine the (absolute) stability of a closed-loop control system.
20MCM14.4	Formulate different types of analysis in frequency domain to explain the nature of stability of the system

Course Name	OPERATION MANAGEMENT
Course Code	20MCM15
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM15.1	Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.
20MCM15.2	Identify the roles and responsibilities of operations managers in different organizational contexts
20MCM15.3	Apply and analyze and evaluate various Linear & Dynamic programming models to various real time problems
20MCM15.4	Solve and analyze problems using different forecasting techniques and develop aggregate capacity plans in different operation environments.

Course Name	CIM LABORATORY
Course Code	20MCML16
Course outcomes (COs): At the end of the course the student will be able to:	
20MCML16.1	Simulate manufacturing processes before being put to actual machining
20MCML16.2	Apply/develop solutions or to do research in the areas of Design and simulation in Mechanical Engineering
20MCML16.3	Developing and applying computer software and hardware to mechanical design and manufacturing fields
20MCML16.4	Formulate relevant research problems; conduct experimental and/or analytical study and analyzing results with modern mathematical / scientific methods and use of software tools.

Course Name	DESIGN OF ROBOTIC SYSTEMS
Course Code	20MCM21
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM21.1	Demonstrate the relationship between mechanical structures of industrial robots and their operational workspace characteristics.
20MCM21.2	Apply the concepts of coordinate transformations for development of arm equation and subsequently the inverse kinematics model for given serial manipulator.
20MCM21.3	Develop and analyze the mathematical model for trajectory planning, resolved motion rate control and dynamics model for a given serial robotic manipulator
20MCM21.4	Develop the algorithms for design of robotic work cell controller and its programming.

Course Name	PROGRAMMABLE LOGIC CONTROLLER
Course Code	20MCM22
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM22.1	Describe and analyze working principles of various types of motors, differences, characteristics and selection criteria, control methods, SCADA.
20MCM22.2	Apply the knowledge in selection of motors, heating effects and braking concepts in various industrial applications.
20MCM22.3	Construct a program using PLC to problems pertaining to automation industries.
20MCM22.4	Demonstrate self-learning capability

Course Name	PNEUMATIC AND HYDRAULIC CONTROL
Course Code	20MCM23
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM23.1	Correlate the basics of hydraulics to the performance of fluid power systems.
20MCM23.2	Describe the working principle of hydraulic systems including pumps and controllers.
20MCM23.3	Correlate the basics of pneumatics to the performance of pneumatic systems.
20MCM23.4	Design and analyse problems relating to Pneumatic and Hydraulic control systems and components.

Course Name	ROBOTICS AND AUTOMATION LABORATORY
Course Code	20MCML26
Course outcomes (COs): At the end of the course the student will be able to:	
20MCML26.1	Write part programs for NC machining
20MCML26.2	Program and control robot path for industrial applications.
20MCML26.3	Simulate manufacturing processes before being put to actual machining
20MCML26.4	Evaluate and synthesize advanced concepts in automation and robotics, demonstrating a comprehensive understanding of their applications.

Course outcomes of second year

Course Name	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM IN AUTOMATION
Course Code	20MCM31
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM31.1	Understand problem solving methods, state space problems and search methods.
20MCM31.2	Understand knowledge acquisition and representation methods.
20MCM31.3	Assess critically the techniques presented and apply them to real world problems.
20MCM31.4	Develop knowledge of decision making and learning methods.

Course Name	PROJECT WORK PHASE – 1
Course Code	20MCM34
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM34.1	Demonstrate a sound technical knowledge of their selected project topic.
20MCM34.2	Undertake problem identification, formulation, and solution.
20MCM34.3	Design engineering solutions to complex problems utilizing a systems approach.
20MCM34.4	Demonstrate the knowledge, skills and attitudes of a professional engineer.

Course Name	MINI PROJECT
Course Code	20MCM35
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM35.2	Habituated to critical thinking and use problem solving skills.
20MCM35.3	Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
20MCM35.4	Learn on their own, reflect on their learning and take appropriate actions to improve it.
20MCM35.2	Habituated to critical thinking and use problem solving skills.

Course Name	INTERNSHIP / PROFESSIONAL PRACTICE
Course Code	20MCMI36
Course outcomes (COs): At the end of the course the student will be able to:	
20MCMI36.1	Gain practical experience within industry in which the internship is done
20MCMI36.2	Acquire knowledge of the industry in which the internship is done.
20MCMI36.3	Develop a greater understanding about career options while more clearly defining personal career goals.
20MCMI36.4	Develop and refine oral and written communication skills.

Course Name	PROJECT WORK PHASE -2
Course Code	20MCM41
Course outcomes (COs): At the end of the course the student will be able to:	
20MCM41.1	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
20MCM41.2	Habituated to critical thinking and use problem solving skills
20MCM41.3	Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
20MCM41.4	Learn on their own, reflect on their learning and take appropriate actions to improve it.