

SEMESTER III

MA3351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

COURSE OBJECTIVES

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis this is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

OUTCOMES:

- Understand how to solve the given standard partial differential equations
- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems

ME3351 ENGINEERING MECHANICS

COURSE OBJECTIVES

- To Learn the use scalar and vector analytical techniques for analysing forces in statically determinate structures
- To introduce the equilibrium of rigid bodies, vector methods and free body diagram
- To study and understand the distributed forces, surface, loading on beam and intensity.
- To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To develop basic dynamics concepts – force, momentum, work and energy;

OUTCOMES:

- Illustrate the vector and scalar representation of forces and moments
- Analyse the rigid body in equilibrium
- Evaluate the properties of distributed forces
- Determine the friction and the effects by the laws of friction
- Calculate dynamic forces exerted in rigid body

MR3351 FLUID MECHANICS AND THERMAL SYSTEMS

COURSE OBJECTIVES

- To knowledge in Fluid Properties and Statics
- To understand the concept of fluid kinematics and Dynamics.
- To learn about the flows in fluid, Viscous flows and flow through pipes
- To understand the basics laws of thermodynamics
- To understand the second law of thermodynamics and entropy

OUTCOMES:

- Recognize the fluid properties, fluid statics and laws of thermodynamics
- Interpret the problems related to kinematics and dynamics of fluids and thermal
- Systems
- Review the energy losses in flow through pipes and steady flow equation in thermal systems.

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- Analyse the fluid flow and thermal process
- Solve the problems related to fluid and thermal systems.

MR3391 DIGITAL ELECTRONICS AND MICROPROCESSOR

COURSE OBJECTIVES

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To familiarize with the design of various combinational digital circuits using logic gates
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To explain the various semiconductor memories and related technology
- To introduce the electronic circuits involved in the making of logic gate

OUTCOMES:

- State the fundamental operating concepts behind digital logic circuits and microprocessors.
- Recognize the use of various digital logic circuits and sub units in microprocessors
- Interpret the information flow in digital logic circuits and the architectures of microprocessors.
- Design the DLC and Microprocessor for the standard applications.
- Create the circuits using DLC and Microprocessor for given applications

MR3392 ELECTRICAL DRIVES AND ACTUATORS

COURSE OBJECTIVES

- To familiarize a relay and power semiconductor devices
- To get a knowledge on drive characteristics
- To obtain the knowledge on DC motors and drives.
- To obtain the knowledge on AC motors and drives.
- To obtain the knowledge on Stepper and Servo motor.

OUTCOMES:

- Recognize the principles and working of relays, drives and motors.

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- Explain the working and characteristics of various drives and motors.
- Apply the solid state switching circuits to operate various types of Motors and Drivers
- Interpret the performance of Motors and Drives.
- Suggest the Motors and Drivers for given applications.

RA3301 ROBOT KINEMATICS

COURSE OBJECTIVES

- To introduce Robots history, terminologies, classification and configurations
- To get knowledge about basic Geometrical and Algebraic approach to solve forward kinematics of serial manipulator.
- To get knowledge about advanced forward kinematics of serial manipulator.
- To get knowledge about inverse kinematics of various serial manipulator.
- To get knowledge about Jacobian aspects and infinitesimal motion of robot mechanisms.

OUTCOMES:

- Explain the history, classifications, and basic terminologies of robotics and various configuration of robots.
- Evaluate forward kinematic model for planar and spatial robot manipulator.
- Evaluate forward kinematic model for multi-DOF robot manipulators.
- Evaluate inverse kinematic model for multi-DOF robot manipulators.
- Evaluate forward kinematic model for differential drive mobile robot.

MR3361 ELECTRICAL DRIVES AND ACTUATORS LABORATORY

COURSE OBJECTIVES

- To impart knowledge on Performance of the fundamental control practices associated with AC and DC machines (starting, reversing, braking, plugging, etc.) using power electronics To impart industry oriented learning
- To evaluate the use of computer-based analysis tools to review the major classes of machines and their physical basis for operation

OUTCOMES:

- Practice the basic working of AC, DC motor, stepper motor, servo motor and synchronous motor using power electronic drive
- Demonstrate the control of AC, DC motor, stepper motor, servo motor and synchronous motor using power electronic drive
- Analyze the performance of AC, DC motor, stepper motor, servo motor and synchronous motor using power electronic drive

RA3311 ROBOT MODELLING AND SIMULATION LABORATORY

COURSE OBJECTIVES

- Make the students knowledgeable in modeling the basic components of a robot
- Make the students knowledgeable in modeling some common joints, links and transmission assembly for a robot.
- Make the students knowledgeable in modeling a robot and its end effector.

OUTCOMES:

- Identify components and physical features of various parts for a robot system and sub systems.
- Model components and physical features of various parts for a robot system and sub systems.
- Create a CAD and simulation model for a robot system and sub systems.

GE3361 PROFESSIONAL DEVELOPMENT

COURSE OBJECTIVES

- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.
- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics,

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search and explore, visualize, interlink, and utilizing many more critical features offered

- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

OUTCOMES:

- Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
- Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding
- Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

SEMESTER IV

ME3493 MANUFACTURING TECHNOLOGY

COURSE OBJECTIVES:

- To study the concepts and basic mechanics of metal cutting and the factors affecting machinability
- To learn working of basic and advanced turning machines.
- To teach the basics of machine tools with reciprocating and rotating motions and abrasive finishing processes.
- To study the basic concepts of CNC of machine tools and constructional features of CNC.
- To learn the basics of CNC programming concepts to develop the part programme for Machine centre and turning centre

OUTCOMES:

- Apply the mechanism of metal removal process and to identify the factors involved in improving machinability.
- Describe the constructional and operational features of centre lathe and other special purpose lathes.

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- Describe the constructional and operational features of reciprocating machine tools.
- Apply the constructional features and working principles of CNC machine tools.
- Demonstrate the Program CNC machine tools through planning, writing codes and setting up CNC machine tools to manufacture a given component.

RA3401 DESIGN OF ROBOT ELEMENTS

COURSE OBJECTIVES:

- To introduce the students to the fundamentals of machine design, material selection and to solve the basic design problems.
- To learn to derive various parameters for modelling links and joints in a robot.
- To learn about Fundamentals of Computer Graphics
- To learn and understand curves and surfaces in robot modelling.
- To learn to derive various parameters for modelling end-effectors of a robot

COURSE OUTCOMES:

- State the design parameters for designing the components of a robot.
- Apply the CAD modelling techniques in designing a Robot
- Analyse the design parameters for designing the components of a robot.
- Formulate the methods for designing the entire robot assembly
- Create a Robot CAD Model.

MR3491 SENSORS AND INSTRUMENTATION

COURSE OBJECTIVES:

- To understand the concepts of measurement technology.
- To learn the various sensors used to measure various physical parameters.
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development
- To learn about the optical, pressure and temperature sensor
- To understand the signal conditioning and DAQ systems

COURSE OUTCOMES:

- Recognize with various calibration techniques and signal types for sensors.

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- Describe the working principle and characteristics of force, magnetic, heading, pressure and temperature, smart and other sensors and transducers.
- Apply the various sensors and transducers in various applications
- Select the appropriate sensor for different applications.
- Acquire the signals from different sensors using Data acquisition systems.

MR3452 CONTROL SYSTEMS ENGINEERING

COURSE OBJECTIVES:

- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response and stability of the systems.
- To learn the various approach for the system frequency analysis
- To understand the concept of stability analysis
- To know about the state variable methods of control system analysis

COURSE OUTCOMES:

- State the various control terminologies and concepts.
- Know the procedures in developing the transfer function, state space models and time and frequency domain analysis methods.
- Apply the procedures on developing the systems in transfer function and state space approach and apply to evaluate the performance of system in time and frequency domain techniques.
- Illustrate the time and frequency response characteristics of system response.
- Analyze the performance of system using various time and frequency domain Techniques.

MR3591 FLUID POWER SYSTEMS AND INDUSTRIAL AUTOMATION

COURSE OBJECTIVES:

- To recognize the standard symbols and to understand the functions of basic fluid power generation and actuation elements.
- To realize the functions of fluid regulation and control elements and its typical uses in fluid power circuit and to acquire the practice on assembling the various types of pneumatic circuits.

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- To familiar and exercise the design procedure of various types of pneumatic and hydraulic fluid power circuits and to provide a training to create the various types of hydraulic circuits.
- To learn about the fundamentals of Programmable Logic Controller.
- To familiarize the Data Communication and Supervisory Control Systems.

COURSE OUTCOMES

- Recognize the various concepts of fluid power and PLC systems.
- Comprehend functions of fluid power and PLC systems.
- Explain the various standard fluid power circuits, functions, communication and IO details of PLC.
- Demonstrate the standard fluid power circuits and PLC based interfaces.
- Construct the fluid power circuits and PLC based automation system.

GE3451 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY

OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

OUTCOMES:

- To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

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- To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
- To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
- To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
- To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

ME3382 MANUFACTURING TECHNOLOGY LABORATORY

COURSE OBJECTIVES:

- To Selecting appropriate tools, equipment's and machines to complete a given job.
- To Performing various welding process using GMAW and fabricating gears using gear making machines.
- To Performing various machining process such as rolling, drawing, turning, shaping, drilling, milling and analyzing the defects in the cast and machined components.

OUTCOMES:

- Demonstrate the safety precautions exercised in the mechanical workshop and join two metals using GMAW.
- The students able to make the work piece as per given shape and size using machining process such as rolling, drawing, turning, shaping, drilling and milling.
- The students become make the gears using gear making machines and analyze the defects in the cast and machined components

MR3461 SENSORS AND INSTRUMENTATION LABORATORY

COURSE OBJECTIVES:

- To learn about various force, pressure and vibration measuring sensors.
- To learn about various Temperature, light and magnetic field measuring sensors
- To learn about various displacement and speed measuring sensors.

COURSE OUTCOMES:

- Demonstrate the various contact and non-contact sensors.
- Analyze and Identify appropriate sensors for given applications.
- Create a sensor system for given requirements

SEMESTER V

MR3492 EMBEDDED SYSTEMS AND PROGRAMMING

And

EMBEDDED SYSTEMS LAB

COURSE OBJECTIVES

- To familiarize the architecture and fundamental units of microcontroller.
- To know the microcontroller programming methodology and to acquire the interfacing skills and data exchange methods using various communication protocols.
- To design the interface circuit and programming of I/O devices, sensors and actuators.
- To understand ARM processor architecture and its functions to meet out the computational and interface needs of growing mechatronic systems.
- To acquaint the knowledge of real time embedded operating system for advanced system developments.

COURSE OUTCOMES

- Know the various functional units of microcontroller, processors and system-on-chip based on the features and specifications.
- Recognize the role of each functional units in microcontroller, processors and system-on-chip based on the features and specifications.
- Interface the sensors, actuators and other I/O's with microcontroller, processors and system on chip based interfacing
- Design the circuit and write the programming microcontroller, processors and system on chip
- Develop the applications using Embedded system.

OTUCOMES

- Know the various functional units of microcontroller, processors and system-on-chip based on the features and specifications.
- Recognize the role of each functional units in microcontroller, processors and system-on-chip based on the features and specifications.
- Interface the sensors, actuators and other I/O's with microcontroller, processors and system on chip based interfacing

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- Design the circuit and write the programming microcontroller, processors and system on chip
- Develop the applications using Embedded system.

RA3501 ROBOT PATH PLANNING AND PROGRAMMING

COURSE OBJECTIVES

- Introduce basic trajectory planning problems.
- Provide a basic review of various path planning theory of manipulator.
- Provide a basic review of various path planning theory of mobile robot.
- Introduction to the most widely used classical motion planning algorithms.
- Introduce sufficient terminology and concepts in ROS for robot programming.

COURSE OUTCOME

- Recognize various trajectory planning and path planning for mobile robot and Manipulator.
- Classify trajectory planning and path planning for mobile robot and Manipulator.
- Choose appropriate Path and Trajectory planning algorithm for various Industrial Applications.
- Plan the path and trajectory for various Industrial robots and mobile robots for specific Applications.
- Program the developed path and trajectory into real time robot applications.

MR3561 INDUSTRIAL AUTOMATION LABORATORY

COURSE OBJECTIVES

- To familiar and exercise the design procedure of various types of pneumatic and hydraulic fluid power circuits.
- To practice the fundamentals of Programmable Logic Controller.
- To practice the Data Communication between PLC.

COURSE OUTCOME

- Design and simulate the fluid power circuits.
- Test the simulated output by constructing the fluid power circuits using suitable actuators and valves.

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- Practice the PLC programming, Interfacing with IO and establish the communication between stations.

CME380 AUTOMOBILE ENGINEERING

COURSE OBJECTIVES

- To study the construction and working principle of various parts of an automobile.
- To study the practice for assembling and dismantling of engine parts and transmission system
- To study various transmission systems of automobile.
- To study about steering, brakes and suspension systems
- To study alternative energy sources

COURSE OUTCOME

- Recognize the various parts of the automobile and their functions and materials.
- Discuss the engine auxiliary systems and engine emission control.
- Distinguish the working of different types of transmission systems.
- Explain the Steering, Brakes and Suspension Systems.
- Predict possible alternate sources of energy for IC Engines.

AU3791 ELECTRIC AND HYBRID VEHICLES

COURSE OBJECTIVES

- Understand the operation and architecture of electric and hybrid vehicles
- Identify various energy source options like battery and fuel cell
- Select suitable electric motor for applications in hybrid and electric vehicles.
- Explain the role of power electronics in hybrid and electric vehicles
- Analyze the energy and design requirement for hybrid and electric vehicles.

COURSE OUTCOME

- Understand the operation and architecture of electric and hybrid vehicles
- Identify various energy source options like battery and fuel cell
- Select suitable electric motor for applications in hybrid and electric vehicles.
- Explain the role of power electronics in hybrid and electric vehicles
- Analyze the energy and design requirement for hybrid and electric vehicles.

CMR358 COMPUTER ARCHITECTURE AND ORGANIZATION

COURSE OBJECTIVES

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the general purpose architecture for computer system.
- To study the design of data path unit and control unit for ALU operation.
- Understanding the concept of various memories.
- To introduce the concept of interfacing and organization of multiple processors

COURSE OUTCOME

- Comprehend and appreciate the significance and role of this course in the present contemporary world
- CO2: Describe data representation, instruction formats and the operation of a digital computer.
- CO3: Illustrate the data path unit and control unit for ALU operation.
- CO4: Discuss about implementation schemes of control unit and pipeline performance.
- Explain the concept of various memories, interfacing and organization of multiple processors and Discuss about the interrupts, I/Os and other components of the system.

CMR332 ADVANCED MANUFACTURING SYSTEMS

COURSE OBJECTIVES

- The objective of this course is to teach the lean tools to attain optimum level in quality.
- To enhance the ability to make decisions for new product development.
- Aims to develop the students to conserve energy and natural resources, and to ensure that they have minimal impact on the environment and society.
- To give students an introduction to an advanced information process technique.
- To learn about the various smart manufacturing techniques and applications.

COURSE OUTCOME

- Demonstrate on basic lean manufacturing.
- Integrate the knowledge on agile manufacturing.
- Formulate strategy in sustainable manufacturing.
- Apply artificial intelligence (AI) and fuzzy techniques to improve the efficiency of manufacturing systems.
- Exposure to smart manufacturing and its various techniques

MX3084 DISASTER RISK REDUCTION AND MANAGEMENT

COURSE OBJECTIVES

- To impart knowledge on concepts related to disaster, disaster risk reduction, disaster management
- To acquaint with the skills for planning and organizing disaster response

COURSE OUTCOME

- To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)
- To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction
- To develop disaster response skills by adopting relevant tools and technology
- Enhance awareness of institutional processes for Disaster response in the country and Develop rudimentary ability to respond to their surroundings with potential
- Disaster response in areas where they live, with due sensitivity

SEMESTER VI

RA3601 ROBOT DYNAMICS AND CONTROL

COURSE OBJECTIVES

- To learn and understand generalized co-ordinates, Jacobian matrix Mass Distribution and other fundamental equations.
- To understand Lagrangean and Hamiltonian mechanics
- To understand nonlinearities in control system
- To Understand various force control strategies
- To understand various concepts in linearizing a no linear signal

COURSE OUTCOME

- Describe generalized co-ordinates, Jacobian matrix Mass Distribution and equation of motion.
- Develop the static force model and inverse dynamic model of multi-degree of freedom (DOF) manipulator. Evaluate dynamics of robot using Lagrangian and Hamiltonian mechanics.
- Describe the control architecture of robot manipulator.
- Evaluate linear and nonlinearities in dynamics of robot.
- Develop the control strategies for robot system

CMR333 COMPUTER AIDED INSPECTION AND TESTING

COURSE OBJECTIVES:

- To familiar the measurement standards and to know the instruments used and various errors in measurements
- To recognize the use of basic and advanced instruments for measurements.
- To learn the applications of opto-electronics device for measurements.
- To describe the various measurement techniques using laser metrology.
- To gain knowledge on computer aided inspection and advances in metrology.

COURSE OUTCOME

- Practice the standards in measurements and to avoid the various forms of errors in measurements.
- Use of basic and advanced metrology instruments for measurements.
- Acquire the knowledge on non-contact opto-electronics device for measurements.
- Describe various measurement techniques using laser metrology.
- Recognize the computer aided inspection and advances in metrology.

CMR356 MICRO ELECTRO MECHANICAL SYSTEMS

COURSE OBJECTIVES:

- To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- To educate on the rudiments of Micro fabrication techniques.
- To introduce various sensors and actuators

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- To introduce different materials used for MEMS
- To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

COURSE OUTCOME

- Recognize MEMS Energy Domains and Transducers, Sensors and Actuators.
- Select the Various MEMS sensors and its Stress and strain
- Apply various MEMS actuators in Real time system.
- Demonstrate various micro machining processes, Structural and Sacrificial Materials
- Analyze the various MEMS inertial, tactile, pressure and flow sensors in real time system

CME396 PROCESS PLANNING AND COST ESTIMATION

COURSE OBJECTIVES:

- To introduce the process planning concepts to make cost estimation for various products after process planning
- To Learn the various Process Planning Activities
- To provide the knowledge of importance of costing and estimation.
- To provide the knowledge of estimation of production costing.
- To learn the knowledge of various Machining time calculations

COURSE OUTCOME

- Discuss select the process, equipment and tools for various industrial products.
- Explain the prepare process planning activity chart.
- Explain the concept of cost estimation.
- Compute the job order cost for different type of shop floor.
- Calculate the machining time for various machining operations.

ME3792 COMPUTER INTEGRATED MANUFACTURING

COURSE OBJECTIVES

- To provide the overview of evolution of automation, CIM and its principles.
- To learn the various Automation tools, include various material handling system.
- To train students to apply group technology and FMS.

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- To familiarize the computer aided process planning in manufacturing.
- To introduce to basics of data transaction, information integration and control of CIM

COURSE OUTCOME

- Discuss the basics of computer aided engineering.
- Choose appropriate automotive tools and material handling systems.
- Discuss the overview of group technology, FMS and automation identification methods.
- Design using computer aided process planning for manufacturing of various components
- Acquire knowledge in computer process control techniques.

RA3611 ROBOT KINEMATICS AND DYNAMICS LABORATORY

COURSE OBJECTIVES

- To model and simulate a robot and verify its kinematics
- To model and simulate a robot and generate a trajectory plan.
- To model and simulate a robot and verify its dynamics

COURSE OUTCOMES

- Analyze the kinematics and dynamics for various robots
- Simulate and evaluate the kinematics and dynamics for various robots
- Create a robot and program a trajectory plan for the robot.