ACHARYA INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF MECHATRONICS

2022 SCHEME

Course Name	Course Code	CO. No.	Course Outcomes
MECHANICS OF SOLID AND FLUIDS -	BMT301	CO1	Determine stresses and strains in simple and composite bars subjected to uni-axial loads as well as elastic constants in them
		CO2	Determine stresses on inclined planes in an elastic body subjected to bi-axial loading, using analytical and graphical methods
		CO3	Compute the torque/power transmission capability of solid and hollow shafts, the buckling load for safe design of columns with different end conditions
		CO4	Explain different types and properties of fluids, aspects of pressure measurement and fluid statics
		CO5	Compute the mass flow rate, velocity and acceleration at any point, forces and energy in the fluid flow
ANALOG AND DIGITAL ELECTRONICS -	BMT302	CO1	Explain the operation and the Design of Op-amp Active Filters.
		CO2	Elucidate the Working Principle and Design of Oscillators and Comparators.
		CO3	Explain the Working Principle and Design of 555 timers and Its applications.
		CO4	Describe the operation and Design of Combinational Logic circuits.
		CO5	Summarize the Working Principle and Learn the Design of Sequential Logic circuits
		CO6	Develop clippers, clampers, amplifiers, 555 timers circuits for the design specifications.
		CO7	Develop and verify the truth table operation of combinational and sequential circuit.
MATERIAL SCIENCE AND MANUFACTURING TECHNOLOGY -	BMT303	CO1	Gain knowledge of basic material structure, mechanical properties and behaviour of engineering materials under the action of load.
		CO2	Explain different types and processing methods of composite materials, and the properties and application of Smart materials
		CO3	Gain knowledge in conventional manufacturing techniques and casting process
		CO4	Explain the principles of common and special welding processes
		CO5	Gain knowledge of metal cutting principles, metal cunning tools and operations.

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		CO6	Determine the mechanical properties of given materials and visualize the micro structure of the specimen
		CO7	Prepare/ develop a physical model by performing different machining operations
COMPUTER ORGANIZATION AND ARCHITECTURE -	BMT304	CO1	Explain the basic structure of computers, machine instructions and programs
		CO2	Illustrate the different types of addressing modes and assembly language
		CO3	Summarize the different of I/O devices and interrupts
		CO4	Illustrate the organization of different types of semiconductor and other secondary storage memories
		CO5	Demonstrate the simple processor organization based on hardwired controller and micro program control
COMPUTER AIDED MACHINE DRAWING -	BMT305	CO1	Illustrate various machine components through drawings
		CO2	Create assembly drawings as per the conventions
SIGNAL & SYSTEMS -	BMT306B	CO1	Explain the fundamentals of signals and its properties.
		CO2	Solve the time representation of LTI systems for various signal operations.
		CO3	Utilize the various signal properties for time representation of LTI Systems.
		CO4	Identify the Fourier Series representation of signals and its properties.
		CO5	Apply Fourier transform for signal representation
ROBOTICS ECOSYSTEM -	BMT358D	CO1	Classify the types of Robots
		CO2	Illustrate the anatomy and components of the robot systems.
		CO3	Explain the functions of end effectors and drive systems in robots
		CO4	Describe the different types and functions of sensors in robotics
		CO5	Elucidate the industrial applications of robots.
MICROCONTROLLER AND APPLICATIONS -	BMT401	CO1	Describe the architecture of 8051 Microcontroller and memory organization
		CO2	Summarize different addressing modes, Assembly and C instruction set
		CO3	Model assembly and C language program for software and hardware applications.
		CO4	Write a program to verify various operation on data transmission
		CO5	Create hardware interface between microcontroller and peripheral units
ELECTRICAL DRIVES AND	BMT402	CO1	Describe the basic concept of Electric drives and Speed-torque conventions.

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CONTROLS -		CO2	Explain the modes of operations of drives and thermal model of motor for heating and cooling.
		CO3	Outline the starting and braking control methods for DC drives.
		CO4	Summarize the starting and braking control methods for AC drives.
		CO5	Explain the microprocessor-based control of electrical drives.
		CO6	Perform DC motor drives to determine control characteristics of DC motors.
		CO7	Perform AC motor drives to determine control characteristics of AC motors.
HYDRAULICS AND PNEUMATICS -	BMT403	CO1	Describe Various components of Hydraulic Circuits and working of various sources of hydraulic power
		CO2	Demonstrate the working of hydraulic actuators and control components
		CO3	Illustrate the concepts on hydraulic circuit design and maintenance.
		CO4	Describe pneumatic system components and its operations.
		CO5	Illustrate the use of electronics components in hydraulic and pneumatic systems.
		CO6	Build the pneumatic/Hydraulic circuits using pneumatic/ hydraulic trainer kit.
		CO7	Simulate pneumatic/hydraulic circuits using virtual platforms.
MECHATRONICS LABORATORY -	BMT404	CO1	Calibrate the sensors LVDT, load cell and Thermo couple
		CO2	Develop a various ALU applications using Assembly Language and design an interface between 8051 and external peripherals for real time applications
INDUSTRIAL IoT -	BMT405B	CO1	Illustrate the architecture, revolution of Industrial IoT System
		CO2	Outline the various of Sensors and Actuators used in Industrial IoT
		CO3	Contrast among the various technologies used in IIOT
		CO4	Explain the different communication protocols used in IIOT applications
		CO5	Describe the various Case Studies of Industrial applications with IoT capability
CNC PROGRAMMING AND SIMULATION -	BMT456C	CO1	To describe the basic components of CNC machines and its operations
		CO2	To create CNC program and simulate different machining operations.

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2021 SCHEME

Course Name	Course Code	CO. No.	Course Outcomes
TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES -	21MAT31	CO1	To solve ordinary differential equations using Laplace transform.
		CO2	Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory.
		CO3	To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations
		CO4	To solve mathematical models represented by initial or boundary value problems involving partial differential equations
		CO5	Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics rigid bodies and vibrational analysis.
ANALOG AND DIGITAL ELECTRONICS	21MT32	CO1	Understand the working principle of Analog & Digital Electronic Circuits
		CO2	Understand the characteristics & response of Analog & Digital Electronic Circuits
		CO3	Formulate the relations for Voltage Gain, Frequency of Various Analog Electronic Circuits & Boolean Expressions for Digital Electronic Circuits
		CO4	Design the Analog & Digital Electronic Circuits for Required Specifications
		CO5	Design and conduct the experiment on clippers ,clampers, amplifiers, 555 timers for the design specifications
		CO6	Design and conduct the experiment to verify the truth table operation of combinational and sequential circuit
MATERIAL SCIENCE AND MANUFACTURING TECHNOLOGY	21MT33	CO 1	Understand mechanical properties of metals, alloys and composites
		CO 2	Describe the process of casting, different methods to process composite materials
		CO 3	Determine the mechanical properties of given materials through material testing experiments
		CO 4	Develop components of different shapes involving conventional machining operations
		CO 5	Prepare/ develop a physical model by performing different machining operations
		CO 6	Determine the mechanical properties of given materials and visualize the micro structure of the specimen

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MECHANICS OF SOLID AND FLUIDS -	21MT34	CO 1	Gain the knowledge of properties, and stress-strain relations in linear elastic solid members and fluids
		CO 2	Describe stress-strain equation for axial, bending and torsion loads while addressing problems in engineering
		CO 3	Apply the concepts of fluid statics, kinematics and dynamics while addressing problems in engineering and to determine the fluid flow through open and closed channel
		CO 4	Determine the stress & strain for simple stresses, compound stresses, shafts & columns
MACHINE DRAWING AND GD & T -	21MTL35	CO1	Interpret the Machining and surface finish symbols on the component drawings
		CO2	Apply limits and tolerances to assemblies and choose appropriate fits for given assemblies
		CO3	Illustrate various machine components through drawings
		CO4	Create assembly drawings as per the conventions
ROBOTICS ECOSYSTEM -	21MT384	CO 1	Understand the functions of different elements of robots
		CO 2	Apply the knowledge of sensors and end effectors in robotics
		CO 3	Analyze the use of different types of robots for different applications
MATHEMATICAL FOUNDATIONS FOR COMPUTING, PROBABILITY & STATISTICS	- 21MATCS41	CO1	Apply the concepts of logic for effective computation and relating problems in the Engineering domain
		CO2	Analyse the concepts of functions and relations to various fields of Engineering
		CO3	Apply discrete and continuous probability distributions in analysing the probability models arising in the engineering field
		CO4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data
		CO5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis
ELECTRICAL DRIVES AND CONTROLS	21MT42	CO 1	Understand the basic concept of Electric drives and controls
		CO 2	Explain the characteristics of AC and DC Motor drives
		CO 3	Apply conventional control methods for AC and DC drives
		CO 4	Apply solid-state speed control methods for AC and DC drives
		CO 5	Conduct experiment to determine control characteristics of DC motors
		CO 6	Conduct experiment to determine control characteristics of AC motors
HYDRAULICS	21MT43	CO 1	Understand different components of pneumatic and

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Course	Code	CO	Description
AND PNEUMATICS			hydraulic circuits
		CO 2	Demonstrate working of valves, solenoids, and pumps
		CO 3	Apply concepts of pneumatic and hydraulic to design and develop respective circuits
		CO 4	Design and analyse Hydraulic/pneumatic circuits
		CO 5	Design pneumatic circuits for various industrial applications using experimental pneumatic kits
		CO 6	Create the graphical simulation for pneumatic and hydraulic circuits
MICROCONTROLLER AND APPLICATIONS -	21MT44	CO1	Describe the architecture of 8051 Microcontroller, microprocessor and internal memory organization, types of memory architecture, Concept of Addressing modes and Assembly and C instruction set
		CO2	Apply various instruction set of assembly and C language for different software and hardware applications
		CO3	Calculate time delays, baud rates and analyze Timer
		CO4	Design the hardware interface between microcontroller and memories of different size , external peripheral devices for real time application
MECHATRONICS LABORATORY -	21MTL46	CO1	Evaluate the performance of the sensors like LVDT, load cell and Thermo couple by Calibrating
		CO2	develop a various data transfer, arithmetic, logical and code conversion applications using Assembly Language
		CO3	Design a interface between 8051 and external peripherals for real time applications
3D-PRINTING TECHNOLOGY -	21MT482	CO 1	Understand steps, software and different key elements used in 3D printer
		CO 2	Develop a program using open-source software to use 3D printer
		CO 3	Apply the knowledge of 3D printers in building model
THEORY OF MACHINES AND MACHINE DESIGN -	21MT51	CO 1	Illustrate Kinematics of Machines, theories of failures and stress concentration
		CO 2	Determine the mobility, power loss due in belt drives
		CO 3	Calculate the stresses, parameters of machine elements subjected to various loads also make proper assumptions with respect to material, FOS for various machine components
		CO 4	Design machine elements like, gears and other simple machine elements
MICRO AND SMART SYSTEM	21MT52	CO 1	Demonstrate the working methodology of smart materials, Microsystems, electronic circuitry in MEMS devices.

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TECHNOLOGY		CO 2	Illustrate the process of silicon wafer preparation, thin film deposition techniques, lithography, etching, bulk & surface micromachining involved in MEMS fabrication.
		CO 3	Examine the behavior of piezoresistive & piezoelectric materials required to fabricate pressure sensor & vibration control structures.
		CO 4	Measure the performance of pressure sensor & vibration control structure in real time applications.
		CO 5	Analyze the behavior of smart materials for different parameters to has sensor and an actuator.
		CO 6	Determine the sensitivity, non linearity and offset voltage of raw pressure sensors and compensated pressure sensor.
INDUSTRIAL AUTOMATION	21MT53	CO 1	Understand the need and basics of Industrial Automation,
		CO 2	Understand knowledge on Automated Manufacturing system
		CO 3	Analyze different types of automated manufacturing systems
		CO 4	Design material handling system in Manufacturing system
CONTROL THEORY AND VIRTUAL INSTRUMENTATION	21MT54	CO1	Demonstrate the concepts of control systems and its specifications for mathematical modelling
		CO2	Understand the structured LabVIEW programming concepts in developing Virtual Instrumentation and use general purpose interface bus and Serial communication Interface
		CO3	Develop the mathematical model for mechanical and electrical systems
		CO4	Analyse various applications on Real time monitoring using DAQ boards
VIRTUAL INSTRUMENTATION LAB	21MTL55	CO1	Develop LabVIEW programming which employs simulating and analysing the data for real time automation
		CO2	Create different control applications using tools available in LabVIEW
		CO3	Design applications that use plug in DAQ boards and built-in analysis functions to process the data
EMBEDDED SYSTEMS	21MT582	CO1	Understand the instruction set of 32-bit microcontroller ARM Cortex M3, and the software tool required for programming in Assembly and C language.
		CO2	Develop assembly language programs using ARM Cortex M3 for different applications. Interface external devices and 1/0 with ARM Cortex M3.
		CO3	Develop C language programs and library functions for embedded system applications.

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CONDITION MONITORING AND MAINTENANCE MANAGEMENT	21MT61	CO1	Obtain knowledge of reliability, maintenance of system, productive maintenance, fault detection and diagnosis.
		CO2	Explain failure, failure frequency, maintenance, concepts of reliability and probability, and reliability centered maintenance.
		CO3	Apply the techniques of total productive maintenance and reliability centered maintenance.
		CO4	Measure and analyze condition of the components to monitor the faults.
PROGRAMMABLE LOGIC CONTROLLER AND SCADA TECHNOLOGY	21MT62	CO1	Demonstrate the concepts of basic programming skills of PLC using logical instructions
		CO2	Apply the architecture process involved in programmable logic controller and basic programming skills of PLC using logical instructions
		CO3	Examine the various operation involved in the PLC input/output module and SCADA system
		CO4	Construct the ladder diagram for PLC using logical instructions, timer and counters, Data Handling instructions and build the SCADA System for Real time industrial process.
		CO5	Develop the Logical Instructions Involved in development of programmable logic controller for various operations
		CO6	Construct the ladder logic for various operations using PLC and SCADA for Industrial Environment
INDUSTRIAL ROBOTICS	21MT63	CO1	To understand the basics of robotics, sensors, Programming and Applications of Robots
		CO2	To illustrate the different applications of robotics in Industries
		CO3	To analyze simple robot kinematics and dynamics
		CO4	To design general robot cell layouts
POWER ELECTRONICS	21MT641	CO1	Have knowledge of semiconductors devices, Thyristors, AC voltage controllers, choppers and inverters
		CO2	Understand the characteristics and working principles of Thyristors, AC voltage controllers, choppers and inverters
		CO3	Apply control techniques to meet the desired operation of AC voltage regulators, rectifiers and commutation
		CO4	Apply control techniques to meet the desired operation of coppers and Inverters
MECHATRONICS ENGINEERING	21MT653	CO1	Illustrate various components of Mechatronics systems.
		CO2	Explain the working principles of transducers and sensors in mechatronics.
		CO3	Apply the knowledge of electromechanical components and PLC in mechatronics applications.

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		CO4	Outline the design process in mechatronics and Mechatronics integrated issues.
ROBOTICS LAB	21MTL66	CO1	Understand the importance and application of robots in virtual environment
		CO2	Design the robot system for point to point and continuous operation
		CO3	Design the robot program for drilling operation

2018 SCHEME COURSE OUTCOMES

Course Name	Course Code	CO. No.	Course Outcomes
TRANFORM CALCULUS, FOURIER SERIES & NUMERICAL TECHNIQUES	18MAT31	CO1	Have The Knowledge Of Laplace Transforms, Fourier Series, Fourier Transforms, Z-Transforms, Calculus Of Variations And Numerical Methods.
		CO2	Solve Engineering Problems Using Laplace Transforms, Fourier Series, Fourier Transforms, Numerical Methods And Calculus Of Variation.
		CO3	Communicate And Reflect On Applications Of Mathematics As Tool.
MATERIAL SCIENCE AND	18MAT32	CO1	Have knowledge of -Mechanical behavior of metals, Smart materials, composite materials, Alloys, Heat treatment process & phase diagrams.
		CO2	understand the mechanism of various Metallurgical process & manufacturing process of composite materials & working of smart sensors
		CO3	application of metallurgical process, production process of composite & working principle of smart sensor for various engineering solutions
MECHANICS OF MATERIALS	18MT33	CO1	Have knowledge of stress-strain relations in linear elastic members
		CO2	Describe stress- strain equation for axial, bending and torsion loads.
		CO3	Determine the stress & strain for simple stresses, compound stresses, beams, shafts & columns
CONTROL SYSTEMS	18MT34	CO1	Demonstrate the concepts of Control systems and its Specifications for mathematical modelling, feedback control and stability analysis in Time and Frequency domains
		CO2	Express and solve system equations in state-variable form (state variable models), Identify open and closed loop control system to Solve Signal Flow graph and reduction of Block diagram
		CO3	Apply root-locus and Routh–Hurwitz stability criterion

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			technique to analyse and design control systems
		CO4	Determine the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs Formulate mathematical modelling of physical systems(Mechanical and Electrical System)
ANALOG & DIGITAL ELECTRONICS	18MT35	CO1	Have knowledge of Analog & Digital Electronic Circuits.
		CO2	Understand the characteristics & operation of Electronic Circuits.
		CO3	Formulate the relations for Voltage Gain ,Frequency of Various Electronics Circuits.
		CO4	Design the Electronics Systems for Required Specifications
COMPUTER ORGANIZATION AND ARCHITECTURE	18MT36	CO1	Explain the basic organization of a computer system.
		CO2	Explain different ways of accessing an input / output device including interrupts
		CO3	Illustrate the organization of different types of semiconductor and other secondary storage memories.
		CO4	Illustrate simple processor organization based on hardwired control and micro programmed control.
MACHINE SHOP AND MATERIAL TESTING LAB	18MTL37	CO1	Understand how to conduct/operate material testing experiments. Demonstrate milling and shaper operation.
		CO2	Perform machining operations on lathe to produce the model. Taper turning calculation and gear setting for thread cutting
		CO3	Determine the mechanical properties of given materials such as Young's modulus, rigidity modulus, Bulks modulus, ultimate strength by conducting tensile, compression, torsion, and bending experiments.
		CO4	Determine hardness and toughness of given material by conducting hardness and impact test
ANALOG AND DIGITAL ELECTRONICS LAB	18MTL38	CO1	Demonstrate the operation of wave shaping networks, amplifiers& clampers.
		CO2	Analyze the performance of 555 timer as monostable & a stable multi vibrator.
		CO3	Design the oscillator & multi vibrator for desired frequency.
		CO4	Construct the combinational & sequential circuits for real time applications.
FLUID MECHANICS AND MACHINES	18MT42	CO1	Describe concept of turbo machines, fluid properties, fluid at statics and motion (kinematics and dynamics).
		CO2	Measurement of fluid flow through pipe and open channel. Apply momentum/energy equation to fluid flow problems.

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		CO3	Determine the properties of fluid and their effect, fluid statics and its application to monometers. Determine the performance of hydraulic turbines & steam turbines.
		CO4	Analyze kinematics and dynamics of fluid flow. Classification of fluid types, fluid flow, turbo machines, and it's compounding. Deduce performance of turbo machines.
MICROCONTROLLER	18MT43	CO1	Describe the architecture of 8051 Microcontroller, microprocessor and internal memory organization, types of memory architecture, Concept of Addressing modes and Assembly and C instruction set.
		CO2	Apply various instruction set of assembly and C language programming for different software and hardware applications.
		CO3	Calculate time delays, baud rates and analyze Timer. Counter operation and Transmission of data serially for different modes of operation.
		CO4	Design the hardware interface between microcontroller, memories of different sizes and external peripherals.
MANUFACTURING TECHNOLOGY	18MT44	CO1	Have knowledge of -Mechanical behavior of metals, Smart materials, composite materials, Alloys, Heat treatment process & phase diagrams.
		CO2	Understand the mechanism of various Metallurgical process & manufacturing process of composite materials & working of smart sensors,.
		CO3	Application of metallurgical process, production process of composite & working principle of smart sensor for various engineering solutions.
THEORY OF MACHINES	18MT45	CO1	Have fundamental knowledge of Kinematics and Dynamics of Machines.
		CO2	Understand the geometry and the motion of the parts of a machine and forces that produces this motion.
		CO3	Determine the mobility, power loss due to friction in various machine elements, balancing mass and its position, stability of a governor and effect of gyroscopic couple on plane disk, Aircraft, stability of two wheelers and ship.
		CO4	Construction of different types of cam profiles for a given data.
INSTRUMENTATION AND MEASUREMENTS	18MT46	CO1	Apply knowledge of Instrumentation to measure Strain, Pressure, Force, Displacement, and Level.
		CO2	Use their skill set to measure resistance, Capacitance and Inductance using various bridge control circuits.
		CO3	Choose various transducers to measure different physical quantities.
		CO4	Analyze the Static and Dynamic Characteristics and

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			Various Measurement instruments.
FLUID MECHANICS AND PNEUMATIC LAB	18MTL47	CO1	Apply principles of fluid mechanics, machines, and pneumatics.
		CO2	Determine the coefficient of discharge of flow measuring devices and performance of turbines.
		CO3	Select the type of turbine required with reference to available head of water and discharge.
		CO4	Design pneumatic circuit for speed control single acting, double acting and sequencing operation.
MICROCONTROLLER LABORATORY	18MTL48	CO1	Develop an interface between 8051 and external peripherals for various applications using C and Assembly Programming.
		CO2	Design microcontroller based circuits for real time applications
		CO3	Develop a microcontroller program for industrial applications.
TECHNOLOGICAL INNOVATION MANAGEMENT AND ENTREPRENEURSHIP	18MT51	CO1	Understand the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup abusiness
		CO2	Describe the functions of Managers, Entrepreneurs and their social responsibilities
		CO3	Understand the components in developing a business plan.
DESIGN AND ANALYSIS OF MACHINE ELEMENTS	18MT52	CO1	Have knowledge of theories of failures, stress concentration, shafts, keys, couplings, gears, bearings and springs, Finite element analysis, elements and nodes.
		CO2	Understand the technique of theories of failure, stress concentration, fatigue strength etc.
		CO3	Calculate the stresses; parameters of machine elements subjected to various loads also make proper assumptions with respect to material, FOS for various machine components.
		CO4	Design machine elements like, gears, power screws, springs and other simple machine elements.
VIRTUAL INSTRUMENTATION	18MT53	CO1	Understand the structured LabVIEW programming concepts in developing Virtual Instrumentation.
		CO2	Build applications employed in various debugging techniques, simulating and analyzing the data and use general purpose interface bus and Serial communication Interface.
		CO3	Create applications that uses plug in DAQ boards and built in analysis functions to process the data.
		CO4	.Design and analyse various applications on Real time monitoring using DAQ boards
HYDRAULICS AND	18MT54	CO1	Have knowledge of hydraulic and pneumatic system and

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PNEUMATICS			its components.
		CO2	Understand the working principle of various hydraulic and pneumatic components.
		CO3	Apply working principles of Hydraulic and Pneumatic Systems for various applications.
		CO4	Determine cause for hydraulic and pneumatic system break down and performance of hydraulic pumps, motors.
MICRO & SMART SYTEMS TECHNOLOGY	18MT55	CO1	Have knowledge of Smart Materials, Sensors &Actuators ,Microsystems.
		CO2	Understand the Working Methodology of Smart Devices & Systems, Electronic Circuits & Control for MEMS, Methodology of Micro-manufacturing
VIRTUAL INSTRUMENTATION LABORATORY	18MTL57	CO1	Develop LabVIEW programming which employs simulating and analyzing the data for real time automation
		CO2	Engage in designing, implementing, analyzing and demonstrating an application using tools in available in LabVIEW through an open ended experiment.
		CO3	Design applications that uses plug in DAQ boards and built in analysis functions to process the data.
MICRO & SMART SYSTEMS TECHNOLOGY LABORATORY	18MTL58	CO1	Understand, Analyze & gain ability to choose Materials for desired applications.
		CO2	Understand, Analyze & gain ability to choose Sensors for desired applications.
PLC AND SCADA	18MT61	CO1	Demonstrate the concepts of basic programming skills of PLC using logical instructions
		CO2	Apply the architecture process involved in programmable logic controller and basic programming skills of PLC using logical instructions
		CO3	Examine the various operation involved in the PLC input/output module and SCADA system
		CO4	Construct the ladder diagram for PLC using logical instructions, timer and counters, Data Handling instructions and Build the SCADA System for Real time industrial process.
POWER ELECTRONICS	18MT62	CO1	Have knowledge of power semiconductor devices, thyristors, AC voltage controllers, choppers and inverters.
		CO2	Understand the characteristics and working principle of thyristors, AC voltage controllers, choppers and inverters.
		CO3	Apply control techniques to meet desired switching objectives.
COMPUTER AIDED MACHINE DRAWING	18MT63	CO1	Sections of pyramids, prisms, cubes, cones and cylinders resting on their bases in 2D

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		CO2	Orthographic views of machine parts with and without sectioning in 2D.
		CO3	Sectional views for threads with terminologies of ISO Metric, square and acme, threads in 2D.
		CO4	Hexagonal headed bolt and nut with washer, assemblies in 2D
		CO5	Parallel key, Taper key, and Woodruff Key as per the ISO standards in 2D
		CO6	Sketch split muff, protected type flanged, pin type flexible assemblies from the part drawings with limits ,fits and tolerance given for Plummer block, Screw Jack, Tailstock of lathe, in 2D and 3D
PLC AND SCADA LABORATORY	18MTL66	CO1	Develop the logical instructions involved in Development of programmable logic controller for various operations
		CO2	Construct the Ladder Logic for various operation using PLC and SCADA for industrial Environment.
		CO3	Design the SCADA System for industrial Environment.
POWER ELECTRONICS LABORATORY	18MTL67	CO1	Understand and verify the characteristics of different power electronic devices.
		CO2	Use the power devices to control the operation of electronic systems.
RAPID PROTOTYPING	18MT642	CO1	Have fundamental knowledge of Rapid Prototyping process, Selective Laser Sintering, Fusion Deposition Modelling, Solid Ground Curing, 3D Printers, Rapid Tooling, Software and Errors.
		CO2	Understand the working Principles of Selective Laser Sintering, Fusion Deposition Modelling Solid Ground Curing, 3D Printers,.
		CO3	Know the applications of Selective Laser Sintering, Fusion Deposition Modelling, Solid Ground Curing, 3D Printers, also software tools like Magic, MMIC.
SATELLITE COMMUNICATION	18MT644	CO1	Have Knowledge of various kinds of Satellites, Satellite Subsystems & Orbits, Trajectory.
		CO2	Understand the Operation of Satellites in space for various applications
COMPUTER INTEGRATED MANUFACTURING	18MT645	CO1	Have fundamental knowledge of CIM
		CO2	Understand the concepts of high volume production, flow line analysis and line balancing, automated, assembly system, computerized manufacturing planning & CNC centers.
		CO3	Apply CIM technology for providing manufacturing solutions
ROBOTICS & AUTOMATION	18MT651	CO1	Have the knowledge of Joints, Links, Sensors, Control units, Actuators. and elements of Automation

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		CO2	Describe motions and control system of Robots.
INDUSTRIAL ROBOTICS	18MT71	CO1	Have knowledge of Robotics, automation, robotics motion, sensors and control, machine vision, robotic programming and roles of robots in industry.
		CO2	Understand the working methodology of robotics and automation, motion and control, machine vision and programming, application of robots in industry.
		CO3	Write the program for robot for various applications.
THERMAL ENGINEERING	18MT72	CO1	Understand the concepts of system, properties, energy interaction, laws of thermodynamics, and heat transfer, and boundary conditions.
		CO2	Apply laws of thermodynamics and laws of heat transfer to engineering system. Define the thermodynamic process and cycle. Determine the energy interaction.
		CO3	Develop heat conduction and temperature distribution equation and describe thermal resistance concept. Determine the rate of heat transfer and temperature at any point in the heat transfer domain.
		CO4	Dimensional analysis of heat transfer and use of dimensional number. Study the effect of contact resistance and addition of insulation.
ROBOTICS LABORATORY	18MTL76	CO1	Analyse the design parameters of Robot for Industrial applications on Robo studio.
		CO2	Develop Robotics Model & workbench prototype for required specifications on Robo studio.
		CO3	Develop & Implement the programs on Industrial Robot for various Real time applications.
		CO4	Evaluate the performance of industrial robot for various application programs.
HEAT TRANSFER LABORATORY	18MTL77	CO1	Perform experiments to determine the thermal conductivity of a metal rod.
		CO2	Conduct experiments to determine convective heat transfer coefficient for free and forced convection and correlate with theoretical values.
		CO3	Estimate the effective thermal resistance in composite slabs and efficiency in pin-fin
		CO4	Determine surface emissivity of a test plate
REAL TIME SYSTEMS	18MT733	CO1	Explain the fundamentals of Real time systems and its classifications.
		CO2	Understand the concepts of computer control and the suitable computer hardware requirements for real-time applications.
		CO3	Describe the operating system concepts and techniques required for real time systems.
		CO4	Develop the software algorithms using suitable

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			languages to meet Real time applications.
		CO5	Apply suitable methodologies to design and develop Real-Time Systems.
ARTIFICIAL INTELLIGENCE	18MT743	CO1	Have Knowledge of Artificial Intelligence, Production Rules, Search Algorithms, Expert System & its architectures, Machine Learning.
		CO2	Understand the working methodology of Search Algorithms, Expert System & Machine Learning.
DIGITAL IMAGE PROCESSING	18MT744	CO1	Have knowledge of different images, enhancement and restoration.
		CO2	Understand how images are formed, sampled, quantized and represented digitally.
		CO3	Process the images by applying different operations and transformation.
MECHATRONICS SYSTEM DSEIGN	18MT752	CO1	Discuss about modeling of Mechatronics System .
		CO2	Explain the actuating devices and signals involved in Mechatronics.
		CO3	Select the sensor and Actuator for a Mechatronics application.
		CO4	Convert the data in real time interfacing.
AUTOMOTIVE ELECTRONICS AND HYBRID VEHICLES	18MT81	CO1	Understanding of Engine Parameters and a critical awareness of current problems within the automotive electronics domain using Various Measurement Technology.
		CO2	Apply the fundamental Concepts of automotive electronics on various Engine parts, Sensor, Actuator, Communication and Measurement System.
		CO3	Determine the extent and nature of electronic circuitry in automotive systems including monitoring and control circuits for engines, transmissions, brakes, steering, suspension
		CO4	Analyze climate control, instrumentation and radios and accessories involved in Automotive Industry.
COMMUNICATION SYSTEM	18MT822	CO1	Able to determine the performance of amplitude modulation schemes in time and frequency domains and sampling process.
		CO2	Able to characterize the performance of modulation and generation and detection of modulated analog signals.
		CO3	Able to Characterize analog signals in time domain as random processes and in frequency domain using Fourier transforms.
		CO4	Able to Determine the performance of different coding techniques for different modulation types and multiplexers

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		CO5	Able to Understand the characteristics of communication systems, pulse amplitude modulation, pulse code modulation systems, digital multiplexers, spread spectrum modulation and its applications.
DIGITAL CONTROL SYSTEM	18MT823	CO1	Have knowledge of State model, Linear and Non Linear Control System, Controllability and Observe viability.
		CO2	Understanding the concepts State model, Linear and Non Linear Control System, Controllability and Observe ability used in Digital Control System.
		CO3	Determine the extent and nature of Lead Lag Circuitry by Plot.