MCT

MANJARA CHARITABLE TRUST
RAJIV GANDHI INSTITUTE OF TECHNOLOGY, MUMBAI
DEPARTMENT OF MECHANICAL ENGIEERING
Course Outcomes (COs) for R19 C- Scheme

Course Code	Name of the Course	CO1	Apply the basic concepts of Complex Numbers and will be able to use it for engineering problems.
MEC301	Engineering Mathematics-III	CO1	Apply the concept of Laplace transform to solve the real integrals in engineering problems.
		CO2	Apply the concept of inverse Laplace transform of various functions in engineering problems.
		CO3	Expand the periodic function by using Fourier series for real life problems and complex engineering problems.
		CO4	Find orthogonal trajectories and analytic function by using basic concepts of complex variable theory.
		CO5	Apply Matrix algebra to solve the engineering problems.
		CO6	Solve Partial differential equations by applying numerical solution and analytical methods for one dimensional heat and wave equations
MEC302	Strength of Materials	CO1	Demonstrate fundamental knowledge about various types of loading and stresses induced.
		CO2	Draw the SFD and BMD for different types of loads and support conditions.
		CO3	Analyse the bending and shear stresses induced in beam.
		CO4	Analyse the deflection in beams and stresses in shaft.
		CO5	Analyse the stresses and deflection in beams and Estimate the strain energy in mechanical elements.
		CO6	Analyse buckling phenomenon in columns.
MEC303	Production Processes	CO1	Demonstrate an understanding of casting process
		CO2	Illustrate principles of forming processes.
		CO3	Demonstrate applications of various types of welding processes.
		CO4	Differentiate chip forming processes such as turning, milling, drilling, etc.
		CO5	Illustrate the concept of producing polymer components and ceramic components.
		CO6	Illustrate principles and working of non-traditional manufacturing
		CO7	Understand the manufacturing technologies enabling Industry 4.0

MEC304	Materials and Metallurgy	CO1	Identify the various classes of materials and comprehend their properties
		CO2	Apply phase diagram concepts to engineering applications
		CO3	Apply particular heat treatment for required property development
		CO4	Identify the probable mode of failure in materials and suggest measures to prevent them
		CO5	Choose or develop new materials for better performance
		CO6	Decide an appropriate method to evaluate different components in service
MEC305	Thermodynamics	CO1	Demonstrate application of the laws of thermodynamics to a wide range ofsystems.
		CO2	Compute heat and work interactions in thermodynamicsystems
		CO3	Demonstrate the interrelations between thermodynamic functions to solve practicalproblems.
		CO4	Compute thermodynamicinteractions using the steam table and Mollier chart
		CO5	Compute efficiencies of heat engines, power cycles.
		CO6	Apply the fundamentals of compressible fluid flow to the relevant systems
MEL301	Materials Testing	CO1	Prepare metallic samples for studying its microstructure following the appropriate procedure.
		CO2	Identify effects of heat treatment on microstructure of medium carbon steel and hardenability of steel using Jominy end Quench test
		CO3	Perform Fatigue Test and draw S-N curve
		CO4	Perform Tension test to Analyze the stress - strain behaviour of materials
		CO5	Measure torsional strength, hardness and impact resistanceof the material
		CO6	Perform flexural test with central and three point loading conditions
MEL302	Machine Shop Practice	CO1	Know the specifications, controls and safety measures related to machines and machining operations.
		CO2	Use the machines for making various engineering jobs.
		CO3	Perform various machining operations

		CO4	Perform Tool Grinding
		CO5	Perform welding operations
MESBL301	CAD –Modeling	CO1	Illustrate basic understanding of types of CAD model creation.
		CO2	Visualize and prepare 2D modeling of a given object using modeling software.
		CO3	Build solid model of a given object using 3D modeling software.
		CO4	Visualize and develop the surface model of a given object using modeling software.
		CO5	Generate assembly models of given objects using assembly tools of a modeling software
		CO6	Perform product data exchange among CAD systems.
MEPBL301	Mini Project – 1A	CO1	Identify problems based on societal /research needs.
		CO2	Apply Knowledge and skill to solve societal problems in a group.
		CO3	Develop interpersonal skills to work as member of a group or leader.
		CO4	Draw the proper inferences from available results through theoretical/ experimental/simulations.
		CO5	Analyse the impact of solutions in societal and environmental context for sustainable development.
		CO6	Use standard norms of engineering practices
		CO7	Excel in written and oral communication.
		CO8	Demonstrate capabilities of self-learning in a group, which leads to life long learning.
		CO9	Demonstrate project management principles during project work.
MEC401	Engineering Mathematics-IV	CO1	Apply the concept of Vector calculus to evaluate line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence theorem.
		CO2	Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
		CO3	Apply the concept of Correlation, Regression and curve fitting to the engineering problems in data science.
		CO4	Illustrate understanding of the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.

		CO5	Apply the concept of probability distribution to engineering problems & testing hypothesis of small samples using sampling theory.
		CO6	Apply the concepts of parametric and nonparametric tests for analyzing practical problems.
MEC402	Fluid Mechanics	CO1	Define properties of fluids, classify fluids and evaluate hydrostatic forces on various surfaces.
		CO2	Illustrate understanding ofdimensional analysis of Thermal and Fluid systems.
		CO3	Differentiate velocity potential function and stream function and solve for velocity and acceleration of a fluid at a given location in a fluid flow.
		CO4	Formulate and solve equations of the control volume for fluid flow systems and Apply Bernoulli's equation to various flow measuring devices.
		CO5	Calculate pressure drop in laminar and turbulent flow, evaluate major and minor losses in pipes
		CO6	Calculate resistance to flow of incompressible fluids through closed conduits and over surfaces.
MEC403	Kinematics of Machinery	CO1	Identify various components of mechanisms
		CO2	Develop mechanisms to provide specific motion
		CO3	Draw velocity and acceleration diagrams of various mechanisms
		CO4	Choose a cam profile for the specific follower motion
		CO5	Predict condition for maximum power transmission in the case of a belt drive
		CO6	Illustrate requirements for an interference-free gear pair
MEC404	CAD/CAM	CO1	Identify suitable computer graphics techniques for 3D modeling.
		CO2	Transform, manipulate objects & store and manage data.
		CO3	Develop 3D model using various types of available biomedical data.
		CO4	Create the CAM Toolpath for specific given operations.
		CO5	Build and create data for 3D printing of any given object using rapid prototyping and tooling processes.
		CO6	Illustrate understanding of various cost effective alternatives for manufacturing products.
MEC405	Industrial Electronics	CO1	Illustrate construction, working principles and applications of power electronic switches.

		CO2	Identify rectifiers and inverters for dc and ac motor speed control.
		CO3	Develop circuits using OPAMP and Timer IC 555.
		CO4	Identify digital circuits for industrial applications.
		CO5	Demonstrate the knowledge of basic functioning of microcontrollers.
		CO6	Analyze speed-torque characteristics of electrical machines for speed control.
MEL401	Industrial Electronics	CO1	Demonstrate characteristics of various electrical and electronics components
		CO2	Develop simple applications built around these components
		CO3	Identify use of different logic gates and their industrial applications
		CO4	Built and demonstrate parameter measurements using microcontroller
		CO5	Test and Analyze speed-torque characteristics of electrical machines for speed control.
MEL402	Kinematics of Machinery	CO1	Draw velocity diagram usingInstantaneous Centre method
		CO2	Find velocity and acceleration of a point on a four-bar mechanism by using Relative method.
		CO3	Analyze velocity and acceleration of a specific link of a slider crank mechanism using graphical approach by Relative method.
		CO4	Plot displacement-time, velocity-time, and acceleration-time diagrams of follower motion.
		CO5	Draw cam profile for the specific follower motion.
		CO6	Develop and build mechanisms to provide specific motion.
MEL403	Python Programming	CO1	Demonstrate understand of basic concepts of python programming.
		CO2	Identify, install and utilize python packages
		CO3	Develop and execute python programs for specific applications.
		CO4	Develop and build python program to solve real-world engineering problems
		CO5	Prepare a report on case studies selected.

Code	Subject	CO	Description
MESBL401	CNC and 3-D Printing	CO1	Develop and execute part programing for any given specific operation.
		CO2	Build any given object using various CNC operations.
		CO3	Demonstrate CAM Tool path and prepare NC- G code.
		CO4	Develop 3D model using available biomedical data
		CO5	Build any given real life object using 3D printing process.
		CO6	Convert 2D images into 3D model.
MEPBL401	Mini Project – 1B	CO1	Identify problems based on societal /research needs.
		CO2	Apply Knowledge and skill to solve societal problems in a group.
		CO3	Develop interpersonal skills to work as member of a group or leader.
		CO4	Draw the proper inferences from available results through theoretical/ experimental/simulations.
		CO5	Analyse the impact of solutions in societal and environmental context for sustainable development.
		CO6	Use standard norms of engineering practices
		CO7	Excel in written and oral communication.
		CO8	Demonstrate capabilities of self-learning in a group, which leads to life long learning.
		CO9	Demonstrate project management principles during project work.
MEC501	Mechanical Measurements and Controls	CO1	Handle, operate and apply the precision measuring instruments / equipment's.
		CO2	Analyze simple machined components for dimensional stability & functionality.
		CO3	Classify various types of static characteristics and types of errors occurring in the system.
		CO4	Classify and select proper measuring instrument for displacement, pressure, flow and temperature measurements.
		CO5	Design mathematical model of system/process for standard input responses and analyse error and differentiate various types of control systems and time domain specifications
		CO6	Analyse the problems associated with stability.

MEC502	Thermal Engineering	CO1	Analyze the three modes of heat transfer in engineering application.
		CO2	Develop mathematical models for different modes of heat transfer.
		CO3	Analyze performance parameters of different types of heat exchangers.
		CO4	Identify and analyze the Transient heat Transfer in engineering applications.
		CO5	Explain construction and working of different components of internal combustion engines.
		CO6	Evaluate engine performance and emission characteristics.
MEC503	Dynamics of Machinery	CO1	Demonstrate working Principles of different types of governors and Gyroscopic effects on the mechanical systems
		CO2	Illustrate basic of static and dynamic forces
		CO3	Determine natural frequency of element/system
		CO4	Determine vibration response of mechanical elements / systems
		CO5	Design vibration isolation system for a specific application
		CO6	Demonstrate basic concepts of balancing of forces and couples
MEC504	Finite Element Analysis	CO1	Solve differential equations using weighted residual methods.
		CO2	Develop the finite element equations to model engineering problems governed by second order differential equations.
		CO3	Apply the basic finite element formulation techniques to solve engineering problems by using one dimensional elements.
		CO4	Apply the basic finite element formulation techniques to solve engineering problems by using two dimensional elements.
		CO5	Apply the basic finite element formulation techniques to find natural frequency of single degree of vibration system.
		CO6	Use commercial FEA software, to solve problems related to mechanical engineering.
MEDLO501X	Department Level Optional Course – 1		
MEDLO5011	Optimization Techniques	CO1	Identify the types of optimization problems and apply the calculus method to single variable problems.
		CO2	Formulate the problem as Linear Programming problem and analyse the sensitivity of a decision variable.

			CO3	Apply various linear and non-linear techniques for problem solving in various domain.
			CO4	Apply multi-objective decision making methods for problem in manufacturing environment and other domain.
			CO5	Apply multi criterion decision making methods for problem in manufacturing environment and other domain.
			CO6	Apply Design of Experiments method for Optimization
MEDLO5012	Statistical Techniques		CO1	Apply the concepts of statistical distributions in engineering applications
			CO2	Use sampling theory for a given data set
			CO3	Fit curve for a given data set
			CO4	Demonstrate the understanding of correlation and regression analysis
			CO5	Perform analysis of variance from the available experimental data.
			CO6	Demonstrate the understanding of Statistical Decision making and Hypothesis testing
MEDLO5013	Computational Methods		CO1	Understand and develop mathematical models of physical systems.
			CO2	Identify an appropriate mathematical formulation to linear algebraic equations.
			CO3	Build an appropriate mathematical formulation to non-linear algebraic equations.
			CO4	Evaluate and interpret the data regression, curve fitting and statistics.
			CO5	Apply the numerical techniques and numerical schemes.
			CO6	Formulate the concept of numerical methods in realistic applications.
MEL501	Thermal Engineering	CO1		Estimate thermal conductivity of engineering materials.
		CO2		Evaluate performance parameters of extended surfaces.
		CO3		Analyze heat transfer parameters in various engineering applications.
		CO4		Analyze engine performance and emission parameters at different operating conditions.
MEL502	Dynamics of Machinery	CO1		Plot and analyze governor characteristics

		CO2	Analyze gyroscopic effect on laboratory model
		CO3	Estimate natural frequency of mechanical systems
		CO4	Analyze vibration response of mechanical systems
		CO5	Determine damping coefficient of a system
		CO6	Balance rotating mass
MEL503	Finite Element Analysis	CO1	Select appropriate element for given problem
		CO2	Select suitable meshing and perform convergence test
		CO3	Select appropriate solver for given problem
		CO4	Interpret the result
		CO5	Apply basic aspects of FEA to solve engineering problems
		CO6	Validate FEA solution
MESBL501	Professional Communication and Ethics –II	CO1	Plan and prepare effective business/ technical documents which will in turn provide solid foundation for their future managerial roles.
		CO2	Strategize their personal and professional skills to build a professional image and meet the demands of the industry.
		CO3	Emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations.
		CO4	Deliver persuasive and professional presentations.
		CO5	Develop creative thinking and interpersonal skills required for effective professional communication.
		CO6	Apply codes of ethical conduct, personal integrity and norms of organizational behaviour.
MEPBL501	Mini Project – 2 A	CO1	Identify problems based on societal /research needs.
		CO2	Apply Knowledge and skill to solve societal problems in a group.
		CO3	Develop interpersonal skills to work as member of a group or leader.
		CO4	Draw the proper inferences from available results through theoretical/ experimental/simulations.

		CO5	Analyse the impact of solutions in societal and environmental context for sustainable development.
		CO6	Use standard norms of engineering practices
		CO7	Excel in written and oral communication.
		CO8	Demonstrate capabilities of self-learning in a group, which leads to life long learning.
		CO9	Demonstrate project management principles during project work.
MEC601	Machine Design	CO1	Use design data book/standard codes to standardise the designed dimensions
		CO2	Design Knuckle Joint, cotter joint and Screw Jack
		CO3	Design shaft under various conditions and couplings
		CO4	Select bearings for a given applications from the manufacturers catalogue.
		CO5	Select and/or design belts and flywheel for given applications
		CO6	Design springs, clutches and brakes
MEC602	Turbo Machinery	CO1	Define various parameters associated with steam generators and turbo machines.
		CO2	Identify various components and mountings of steam generators with their significance.
		CO3	Identify various turbo machines and explain their significance.
		CO4	Apply principles of thermodynamics and fluid mechanics to estimate various parameters like mass flow rate power, torque, efficiency, temperature, etc.
		CO5	Evaluate performance of SG and Turbo machines and apply various techniques to enhance performance.
		CO6	Evaluate various phenomena related to performance like cavitation, choking, surging.
MEC603	Heating, Ventilation, Air conditioning and Refrigeration	CO1	Illustrate the fundamental principles and applications of refrigeration and air conditioning systems.
		CO2	Identify various HVAC&R components
		CO3	Evaluate performance of various refrigeration system
		CO4	Estimat e cooling and heating loads for an airconditioning system.

		CO5	Select air handling unit & design air distribution system
		CO6	Apply the knowledge of HVAC for the sustainable developmentof refrigeration and . airconditioning system
MEC604	Automation and Artificial Intelligence	CO1	Demonstrate understanding of fundamentals of industrial automation and AI.
		CO2	Design & develop pneumatic / hydraulic circuits.
		CO3	Design and develop electropneumatic circuits and PLC ladder logics.
		CO4	Demonstrate understanding of robotic control systems and their applications.
		CO5	Demonstrate understanding of various AI and machine learning technologies.
MEDLO602X	Department Level Optional Course – 2		
MEDLO6021	Press Tool Design	CO1	To acquaint with various press working operations for mass production of sheet metal components
		CO2	To familiarise with sheet metal working techniques for design of press tools
		CO3	To inculcate knowledge about scrap minimization, safety aspects and automation in press working
MEDLO6022	Tool Engineering	CO1	Calculate the values of various forces involved in the machining operations
		CO2	Design various single and multipoint cutting tools
		CO3	Analyze heat generation in machining operation and coolant operations
		CO4	Illustrate the properties of various cutting tool materials and hence select an appropriate tool material for particular machining application
		CO5	Demonstrate the inter-relationship between cutting parameters and machining performance measures like power requirement, cutting time, tool life and surface finish
		CO6	Analyze economics of machining operations
MEDLO6023	Metal FormingTechnology	CO1	Understand the concept of different metal formingprocess.
		CO2	Approach metal forming processes both analytically andnumerically
		CO3	Design metal formingprocesses
		CO4	Develop approaches and solutions to analyze metal forming processes and the associated problems andflaws.

MEL601	Machine Design	CO1	Design shaft under various conditions
		CO2	Design Knuckle Joint / cotter joint
		CO3	Design Screw Jack
		CO4	Design Flexible flange couplings/ Leaf spring
		CO5	Convert design dimensions into working/manufacturing drawing
		CO6	Use design data book/standard codes to standardise the designed dimensions.
MEL602	Turbo Machinery	CO1	Differentiate boiler, boiler mountings and accessories
		CO2	Conduct a trial on reciprocating compressor / centrifugal compressor.
		CO3	Conduct a trial on impulse turbine and analyze its performance
		CO4	Conduct a trail on reaction turbine and analyze its performance
		CO5	Conduct a trial on Centrifugal pump and analyze its performance
		CO6	Conduct a trial on Reciprocating pump and analyze its performance
		CO7	Conduct a trial on gear pump
MEL603	Heating, Ventilation, Air conditioning and Refrigeration	CO1	Aware of the roles and ethics of HVAC &R engineers in related industries.
		CO2	Present the impact of professional engineering solutions in societal and environmental contexts.
		CO3	performance of HVAC &R systems Evaluat
		CO4	Develop awareness of the engineering and technological aspects in the HVAC &R industries.
		CO5	Communicate effectively through the preparation ofreport and practical presentation.
		CO6	Analyse of HVAC&R invarious application
MESBL601	Measurements and Automation	CO1	Apply inspection gauge to check or measure surface parameters.
		CO2	Measure surface parameters using precision measurement tools and equipment.

		CO3	Measure different mechanical parameters by using sensors.
		CO4	Analyse the response of a control systems.
		CO5	Demonstrate use of automated controls using pneumatic and hydraulic systems.
		CO6	Implement program on PLC system and demonstrate its application
MEPBL601	Mini Project – 2 B	CO1	Identify problems based on societal /research needs.
		CO2	Apply Knowledge and skill to solve societal problems in a group.
		CO3	Develop interpersonal skills to work as member of a group or leader.
		CO4	Draw the proper inferences from available results through theoretical/ experimental/simulations.
		CO5	Analyse the impact of solutions in societal and environmental context for sustainable development.
		CO6	Use standard norms of engineering practices
		CO7	Excel in written and oral communication.
		CO8	Demonstrate capabilities of self-learning in a group, which leads to life long learning.
		CO9	Demonstrate project management principles during project work.
MEC701	Design of Mechanical System	CO1	Apply the concept of system design.
		CO2	Select appropriate gears for power transmission on the basis of given load and speed
		CO3	Design material handling systems such as hoisting mechanism of EOT crane
		CO4	Design belt conveyor systems
		CO5	Design engine components such as cylinder, piston, connecting rod and crankshaft
		CO6	Design pumps for the given applications
MEC702	Logistics and Supply Chain Management	CO1	Demonstrate a sound understanding of Logistics and Supply Chain Management concepts and their role in today's business environment.
		CO2	Identify the drivers of supply chain performance and risks in supply chain management.

		CO3	Apply various techniques of inventory management and rank the items using inventory management technique
		CO4	Apply various strategies and techniques to minimize overall logistics cost
		CO5	Understand the role of digitization in supply chain management leading to sustainability
		CO6	Apply various mathematical models/tools to design the supply chain network
MEDLO703X	Department Level Optional Course – 3		
MEDLO7031	Automotive Power Systems	CO1	Demonstrate the working of Fuel supply and ignition system of I.C. engines
		CO2	Illustrate the working of lubrication, cooling and supercharging systems.
		CO3	Comprehend the different technological advances in engines and alternate fuels
		CO4	Identify and describe the history and different EV/HEV drivetrain topologies
		CO5	Compare and evaluate various energy sources and energy storage components for EV and HEV application.
		CO6	Comprehend EV and HEV working through Case studies.
MEDLO7032	Renewable Energy Sources	CO1	Describe the need for renewable energy and its potential for the development of a sustainable environment.
		CO2	Analyze different solar collectors using geometrical parameters and photovoltaics for generation of solar energy.
		CO3	Identify and analyze various wind turbine energy harnessment techniques.
		CO4	Design biogas plant for harnessing energy from organic waste.
		CO5	Describe significance of hydrogen energy to fulfill present and future energy needs.
		CO6	Describe the operating principle of geothermal energy and ocean energy and their role in sustainable development.
MEDLO7033	Vehicle Systems	CO1	Understand the working of different Vehicle Systems and Subsystems.
		CO2	Understand the working of different Vehicle Electrical systems and subsystems.
		CO3	Understand different Vehicle Body systems and layouts.
		CO4	Illustrate working and functions of different vehicle mechanical,electrical and chassis systems.

		CO5	Understand the effect of aerodynamics on the functioning of a vehicle.
		CO6	Comprehend the different technological advances in vehicle systems.
MEDLO704X	Department Level Optional Course – 4		
MEDLO7041	Machinery Diagnostics	CO1	Relate basic concepts of Machinery Diagnostic.
		CO2	Describe the working of Vibration Measuring Instruments.
		CO3	Apply different Signal Processing Techniques in Vibration Measurement.
		CO4	Identify common faults in Machinery using Vibration Spectrum.
		CO5	Interpret the Vibration Signals for Monitoring and Prognosis.
MEDLO7042	Vibration Controls	CO1	Apply basic concepts of Vibration Isolation and Damping.
		CO2	Identify suitable Vibration Absorber
		CO3	Identify suitable Vibration Isolator
		CO4	Apply suitable method to Control the vibrations to the acceptable level.
MEDLO7043	Advanced Vibration	CO1	Estimate natural frequency of mechanical element / system.
		CO2	Understand the concepts of Vibration Isolation and Control.
		CO3	Analyse vibratory response of mechanical element / system.
		CO4	Analyse vibration of Continuous system.
		CO5	Analyse Random Vibrations.
		CO6	Analyse Non-Linear Vibrations.
ILO701X	Institute Level Optional Course – I*		
ILO7011	Product Life Cycle Management	CO1	Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
		CO2	Illustrate various approaches and techniques for designing and developing products.
		CO3	Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.

		CO4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
ILO7012	Reliability Engineering	CO1	Understand and apply the concept of Probability to engineering problems
		CO2	Apply various reliability concepts to calculate different reliability parameters
		CO3	Estimate the system reliability of simple and complex systems
		CO4	Carry out a Failure Mode Effect and Criticality Analysis
ILO7013	Management Information System	CO1	Explain how information systems Transform Business
		CO2	Identify the impact information systems have on an organization
		CO3	Describe IT infrastructure and its components and its current trends
		CO4	Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making
		CO5	Identify the types of systems used for enterprise-wide knowledge management and how they provide value for businesses
ILO7014	Design of Experiments	CO1	Plan data collection, to turn data into information and to make decisions that lead to appropriate action
		CO2	Apply the methods taught to real life situations
		CO3	Plan, analyze, and interpret the results of experiments
ILO7015	Operations Research	CO1	Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.
		CO2	Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
		CO3	Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
		CO4	Understand the applications of integer programming and a queuing model and compute important performance measures
ILO7016	Cyber Security and Laws	CO1	Understand the concept of cybercrime and its effect on outside world
		CO2	Interpret and apply IT law in various legal issues
		CO3	Distinguish different aspects of cyber law

		CO4	Apply Information Security Standards compliance during software design and development
ILO7017	Disaster Management and Mitigation Measures	CO1	Get to know natural as well as manmade disaster and their extent and possible effects on the economy.
		CO2	Plan of national importance structures based upon the previous history.
		CO3	Get acquainted with government policies, acts and various organizational structure associated with an emergency.
		CO4	Get to know the simple do's and don'ts in such extreme events and act accordingly.
ILO7018	Energy Audit and Management	CO1	To identify and describe present state of energy security and its importance.
		CO2	To identify and describe the basic principles and methodologies adopted in energy audit of an utility.
		CO3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.
		CO4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities
		CO5	To analyze the data collected during performance evaluation and recommend energy saving measures
ILO7019	Development Engineering	CO1	Apply knowledge for Rural Development.
		CO2	Apply knowledge for Management Issues.
		CO3	Apply knowledge for Initiatives and Strategies
		CO4	Develop acumen for higher education and research.
		CO5	Master the art of working in group of different nature.
		CO6	Develop confidence to take up rural project activities independently
MEL701	Design of Mechanical System	CO1	Apply the concept of system design.
		CO2	Design of hoisting mechanism of EOT crane
		CO3	Design belt conveyor systems
		CO4	Design pumps for the given applications
		CO5	Design engine components such as cylinder, piston, connecting rod and crankshaft

MEL702	Maintenance Engineering	CO1	Identify different tools used for maintenance.
		CO2	Apply different maintenance strategies.
		CO3	Demonstrate the process of servicing a machine.
		CO4	Identify common faults in Machinery using Vibration Spectrum.
		CO5	Interpret the Vibration Signals for Monitoring and Prognosis.
MEL703	Industrial Skills	CO1	To familiarise mechanical engineering students with basiccomputer/IT skillsin the industry.
		CO2	To practise soft skills and communication to be industry-ready.
		CO3	To inculcate critical thinking and problem-solving abilities for efficient team and project outcomes.
		CO4	To be prepared for campus placements by practising aptitude, logical reasoning, Group discussion and personal interview rounds.
MEP701	Major Project I	CO1	Students will be able to develop the understanding of the problem domain through extensive review of literature.
		CO2	Students will be able to identify and analyze the problem in detail to define its scope with problem specific data.
		CO3	Students will be able to identify various techniques to be implemented for the selected problem and related technical skills through feasibility analysis.
		CO4	Students will be able to design solutions for real-time problems that will positively impact society and environment..
		CO5	Students will be able to develop clarity of presentation based on communication, teamwork and leadership skills.
		CO6	Students will be able to inculcate professional and ethical behavior.
MEC801	Operations Planning and Control	CO1	Illustrate operations functions and manage operations in a better way.
		CO2	Apply various strategies to develop aggregate production plan based on the demand forecasting.
		CO3	Apply various algorithms in scheduling and sequencing of manufacturing and service operations
		CO4	Develop Material Requirements Plans (MRP) to estimate the planned order releases
		CO5	Apply various techniques for facility layout planning and line balancing to optimize the resources
		CO6	Demonstrate the importance of implementation of JIT, Lean, Agile and Synchronous manufacturing in manufacturing and service organizations.

MEDLO805X	Department Level Optional Course – 5		
MEDLO8051	Composite Materials	CO1	Select the type of material for the fibres and matrix in a composite material for the given application.
		CO2	Relate stresses and strains through the elastic constants for a given lamina.
		CO3	Evaluate elastic properties of a lamina based on the properties of its constituents.
		CO4	Predict failure of a lamina under the given loading condition.
		CO5	Select the number of laminae and their stacking sequence in a composite material for the given loading condition.
		CO6	Identify the type of damage occurring in a composite structure and select an appropriate method to repair it.
MEDLO8052	Smart Materials	CO1	Classify and select different types of smart materials
		CO2	Comprehend Important Concepts and principles of Smart Materials
		CO3	synthesis, sensing and actuation of Piezoelectric Materials, Magneto strictive Materials, Shape Memory Alloys, Electroactive Polymers
		CO4	synthesis, sensing and actuation of Ferrofluids and Magneto rheological Fluids, Soft Matter, Carbon Nanotubes and Carbon nanostructures, Thermoelectric Materials
		CO5	Classify and select Smart Materials for Energy Applications: Materials used for energy storage
		CO6	Classify and select Composite Materials, Nano Composite Materials
MEDO8053	Micro Electro Mechanical Systems (MEMS)	CO1	Apply laws of scaling for development of a MEMS device
		CO2	Understand the materials and their processing to make MEMS
		CO3	Select and use microfabrication techniques for microsystems
		CO4	Understand the development of micro sensors and actuators
		CO5	Analyze microsystems technology for technical feasibility as well as practicality
		CO6	Develop useful applications of MEMS.
MEDLO806X	Department Level Optional Course – 6		
MEDLO8061	Product Design and Development	CO1	Describe the process of product design & development.
		CO2	Employ engineering, scientific, and mathematical principles to develop and execute a design project from a concept to a finished product.

		CO3	Create 3D solid models of mechanical components using CAD software.
		CO4	Demonstrate individual skills using selected manufacturing techniques such as rapid prototyping.
		CO5	Fabricate an electromechanical assembly of a product from engineering drawings.
		CO6	Effectively communicate the results of projects and other assignments both in a written and oral format.
MELO8062	Design for X	CO1	Applydesignconcepts and guidelines formanufacturing and assembly.
		CO2	Demonstrate the concept of value analysis and its relevance.
		CO3	Understand the economics of product development
		CO4	Applydesignconceptsforreliability and maintainability
MEDLO8063	Total Quality Management	CO1	To apply QM and principles of TQM in organizational development process.
		CO2	To apply the QC & QM tools in process improvement.
		CO3	To apply SQC techniques to improve process quality.
		CO4	To apply Six Sigma project in TQM Implementation
		CO5	To apply QMS and Certification for Quality Accreditation
		CO6	To apply the advanced tools for Quality Sustainability.
ILO802X	Institute Level Optional Course – 2		
ILO8021	Project Management	CO1	Apply selection criteria and select an appropriate project from different options.
		CO2	Write work break down structure for a project and develop a schedule based on it.
		CO3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.
		CO4	Use Earned value technique and determine & predict status of the project.
		CO5	Capture lessons learned during project phases and document them for future reference
ILO 8022	Finance Management	CO1	Understand Indian finance system and corporate finance

		CO2	Take investment, finance as well as dividend decisions
ILO8023	Entrepreneurship Development and Management	CO1	Understand the concept of business plan and ownerships
		CO2	Interpret key regulations and legal aspects of entrepreneurship in India
		CO3	Understand government policies for entrepreneurs
ILO8024	Human Resource Management	CO1	Understand the concepts, aspects, techniques and practices of the human resource management.
		CO2	Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective.
		CO3	Gain knowledge about the latest developments and trends in HRM.
		CO4	Apply the knowledge of behavioural skills learnt and integrate it with in inter personal and intergroup environment emerging as future stable engineers and managers.
ILO8025	Professional Ethics and Corporate Social Responsibility (CSR)	CO1	Understand rights and duties of business
		CO2	Distinguish different aspects of corporate social responsibility
		CO3	Demonstrate professional ethics
		CO4	Understand legal aspects of corporate social responsibility
ILO8026	Research Methodology	CO1	Prepare a preliminary research design for projects in their subject matter areas
		CO2	Accurately collect, analyze and report data
		CO3	Present complex data or situations clearly
		CO4	Review and analyze research findings
ILO8027	IPR and Patenting	CO1	understand Intellectual Property assets
		CO2	assist individuals and organizations in capacity building
		CO3	work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting
ILO 8028	Digital Business Management	CO1	Identify drivers of digital business
		CO2	Illustrate various approaches and techniques for E-business and management

		CO3	Prepare E-business plan
ILO8029	Environmental Management	CO1	Understand the concept of environmental management
		CO2	Understand ecosystem and interdependence, food chain etc.
		CO3	Understand and interpret environment related legislations
MEL801	Product Design and Development	CO1	Identify the need for developing products
		CO2	Select suitable PD&D processes
		CO3	apply the creativity & industrial design methods to design & develop the chosen product
		CO4	Work collaboratively in a team to complete a PD&D project.
		CO5	Effectively communicate the results of projects and other assignments both in a written and oral format.
MEL802	Laboratory based on IoT	CO1	Develop simple applications using microcontrollers 8051 and Arduino.
		CO2	Interface simple peripheral devices to a Microcontroller.
		CO3	Use microcontroller based embedded platforms in IoT.
		CO4	Use wireless peripherals for exchange of data.
		CO5	Setup cloud platform and log sensor data.
MEP801	Major Project II	CO1	Students will be able to implement solutions for the selected problem by applying technical and professional skills.
		CO2	Students will be able to analyze impact of solutions in societal and environmental context for sustainable development.
		CO3	Students will be able to collaborate best practices along with effective use of modern tools.
		CO4	Students will be able to develop proficiency in oral and written communication with effective leadership and teamwork.
		CO5	Students will be able to nurture professional and ethical behavior.
		CO6	Students will be able to gain expertise that helps in building lifelong learning experience.