MAR BASELIOS CHRISTIAN COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

2019 SCHEME SYLLABUS COURSE OUTCOMES

	CODE	COURSE NAME	COURSE OUTCOMES
SEMESTER - I	EST 110	ENGINEERING GRAPHICS	Draw the projection of points and lines located in different quadrants
			Prepare multiview orthographic projections of objects by visualizing them in different positions
			Draw sectional views and develop surfaces of a given object
			Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.
			Convert 3D views to orthographic views
			Obtain multiview projections and solid models of objects using CAD tools
SEMESTER - I	EST120	BASICS OF CIVIL & MECHANICAL ENGINEERING	Illustrate the working and features of IC Engines
			Explain the basic principles of Refrigeration and Air Conditioning
			Describe the working of hydraulic machines
			Explain the working of power transmission elements
			Describe the basic manufacturing, metal joining and machining processes
			Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
			Explain different types of buildings, building components, building materials and building construction
			Describe the importance, objectives and principles of surveying
			Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
			Discuss the Materials, energy systems, water management and environment for green buildings.
			Analyse thermodynamic cycles and calculate its efficiency
SEMESTER - I	PHT100	ENGINEERING PHYSICS	Compute the quantitative aspects of waves and oscillations in engineering systems.
			Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.
			Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
			Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems
			Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system
SEMESTER - I	UN 101	LIFE SKILLS	Define and Identify different life skills required in personal and professional life
			Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
			Explain the basic mechanics of effective communication and demonstrate these through presentations.
			Take part in group discussions
			Use appropriate thinking and problem solving techniques to solve new problems
			Understand the basics of teamwork and leadership
SEMESTER - I	BE110	LINEAR ALGEBRA AND CALCULUS	solve systems of linear equations, diagonalize matrices and characterise quadratic forms
			compute the partial and total derivatives and maxima and minima of multivariable functions
			compute multiple integrals and apply them to find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas
			perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
			determine the Taylor and Fourier series expansion of functions and learn their applications.
SEMESTER - I	PHL 120	ENGINEERING PHYSICS LAB	Illustrate various types, uses and properties of various building materials.
			Understand the need for precise measurement practices for data recording
			Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations
			Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics
			Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results
SEMESTER - I	BE103	CIVIL & MECHANICAL WORKSHOP	Name different devices and tools used for civil engineering measurements
			Explain the use of various tools and devices for various field measurements
			Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.
			Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.
			Compare different techniques and devices used in civil engineering measurements
			Identify Basic Mechanical workshop operations in accordance with the material and objects

SEMESTER - II	MAT102	VECTOR CALCULUS,DIFFERENTIAL EQUATION AN	Compute the derivatives and line integrals of vector functions and learn their applications
			Evaluate surface and volume integrals and learn their inter-relations and applications.
			Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
			Compute Laplace transform and apply them to solve ODEs arising in engineering
			Determine the Fourier transforms of functions and apply them to solve problems arising in engineering
	CYT 100	ENGINEERING CHEMISTRY	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
			Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
			Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterisation of nanomaterials.
			Learn about the basics of stereochemistry and its application. Apply the knowledge of conducting polymers and advanced polymers in engineering.
			Study various types of water treatment methods to develop skills for treating wastewater.
	EST100	ENGINEERING MECHANICS	Recall principles and theorems related to rigid body mechanics
			Identify and describe the components of system of forces acting on the rigid body
			Apply the conditions of equilibrium to various practical problems involving different force system.
			Choose appropriate theorems, principles or formulae to solve problems of mechanics.
			Solve problems involving rigid bodies, applying the properties of distributed areas and masses
			Describe the principle of operation of different type of AC motors
SEMESTER - II	ST 102	PROGRAMING IN C	Analyze a computational problem and develop an algorithm/flowchart to find its solution
			Develop readable* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.
			Write readable C programs with arrays, structure or union for storing the data to be processed
			Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
			Write readable C programs which use pointers for array processing and parameter passing
			Develop readable C programs with files for reading input and storing output
SEMESTER - II	EST130	BASICS OF ELECTRICAL AND ELECTRONICS ENGI	Apply fundamental concepts and circuit laws to solve simple DC electric circuits
			Develop and solve models of magnetic circuits
			Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state
			Describe working of a voltage amplifier
			Outline the principle of an electronic instrumentation system
			Explain the principle of radio and cellular communication
SEMESTER - II	UN102	PROFESSIONAL COMMUNICATION	Develop vocabulary and language skills relevant to engineering as a profession
			Analyze, interpret and effectively summarize a variety of textual content
			Create effective technical presentations
			Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus
			Identify drawbacks in listening patterns and apply listening techniques for specific needs
			Create professional and technical documents that are clear and adhering to all the necessary conventions
SEMESTER - II	ESL130	ELECTRICAL & ELECTRONICS WORKSHOP	Demonstrate safety measures against electric shocks.
			Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols
			Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings
			Identify and test various electronic components
			Draw circuit schematics with EDA tools
			Apply theoretical concepts of LASER and Grating.
	CY 120	ENGINEERING CHEMISTRY LAB	Students will be able to elucidate the structures of organic molecules from spectral data.
			Students will be able to understand the fundamental and applied concepts of Electrochemistry.
			Students develop understanding of the theories of instrumental methods in analytical chemistry.
			Students will be able to understand the properties and applications of engineering materials.
			Students will be able to compute the property of fuels and lubricating oils.
			Students will be able to make technology choice to deal with water quality issues.
			Assemble and test electronic circuits on boards
			Understand and learn basic concepts of stress and strain in solids

SEMESTER - III	MET 201	Mechanics of Solid	Analyse the strength of materials using stress-strain relationships for structural and thermal loading
			Practice exercises of stresses and strain in simple structural members
			Discussion on the principal planes and stresses and demonstrate the results to combined loading case.
			Evaluate the shear force and bending moment diagrams of beams and analyze them
	MET 203	Mechanics of Fluid	Define Properties of Fluids and Solve hydrostatic problems
			Explain fluid kinematics and Classify fluid flows
			Interpret Euler and Navier-Stokes equations and Solve problems using Bernoulli's equation
			Evaluate energy loses in pipes and sketch energy gradient lines
			Explain the concept of boundary layer and its applications
	MET 205	Metallurgy and Material Science	Identify the crystal structures of metallic materials.
			Analyze the binary phase diagrams of alloys Fe-Fe3C, etc.
			Correlate the microstructure with properties, processing and performance of metals.
			Recognize the failure of metals with structural change.
			Select materials for design and construction.
SEMESTER - III	HS200	Business Economics	Understand elementary principles of Economics and Business Economics.
			Analyse the various market situations with good grasp on the effect of trade cycle.
			Anlayse the basic macro-economic concepts and monetary theory.
			Undestand macro- economic concepts to improve their ability to analyse the business climate.
			Analyse their employability by combining their technical knowledge with appropriate economic models.
			Attain knowledge of elementary accounting concepts used for prepairing balance sheet and interpretation of balace sheets.
	MEL 201	CAD	Apply the knowledge of engineering drawings and standards to prepare standard dimensioned drawings of machine parts and other engineering components.
			Preparestandard assembly drawings of machine components and valvesusing part drawings and bill of materials.
			Apply limits and tolerances to components and choose appropriate fits for given assemblies
			Interpret the symbols of welded, machining and surface roughness on the component drawings.
			Prepare part and assembly drawings and Bill of Materials of machine components and valves using CAD software.
SEMESTER - III	MAT201	Partial Differential Equation And Complex Analysis	Understand the concept and the solution of partial differential equation.
			Analyse and solve one dimensional wave equation and heat equation.
			Understand complex functions, its continuity differentiability
			Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral FORMULA
			Understand the series expansion of complex function about a singularity
	MEL 203	Material Testing Lab	To determine the Modulus of Elasticity of steel and wood using UTM
			To verify Clerk- Maxwell's Reciprocal Theorem and hence determine the Modulus of elasticity of steel.
			To determine the Modulus of rigidity of steel using torsion test, spring test and torsion pendulum
			To analyse the toughness of a specimen using Impact testing machine.
			To test the hardness of a material by Rockwell, Brinell and Vicker Hardness test.
SEMESTER -IV	MET202	Engineering Thermodynamics	Students will be able to acquire fundamental knowledge in thermodynamic concepts.
			Students will be able to understand different laws of thermodynamics and to apply them in practice when called for.
			Students will be able to analyze preliminary problems of change in entropy in various thermodynamic processes.
			Students will be able to apply thermodynamic relations and problem solving ability with respect to issues related to social interest.
			Students will gain knowledge in thermodynamic properties of pure substances .
	MET 204	Manufacturing Process	Will you be able to summarise an various moulding techniques to produce engineering components
			Will you be able to describe the principles and procedures behind rolling
			Can you be able to summarise various process parameters in forging
			Can select proper location method as per mechanical design
			Will you be able to differntiate various sheet metal working operation
	MET 206	Fluid Machinery	Students will be able to select an appropriate pump/turbine with reference to given application/situation.
			Students will be able to estimate the optimum efficiency of a given pump/turbine under different load and (or) speed conditions
			Students will be able to apply the fundamental principles of fluid mechanics in calculations .
			Students will be able to analyse the trends depicted by characteristic curves obtained from the experiments

SEMESTER -IV	MEL 204	MT Lab 1	The students can operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality
			Apply cutting mechanics to metal machining based on cutting force and power consumption.
			Select appropriate machining processes and process parameters for different metals
			Fabricate and assemble various metal components by welding
			Infer the changes in properties of steel on annealing, normalizing,
SEMESTER -IV	MEL 202	FM and HM Lab	Students will be able to select an appropriate pump/turbine with reference to given application/situation.
			Students will be able to estimate the optimum efficiency of a given pump/turbine under different load and (or) speed conditions
			Students will be able to apply the fundamental principles of fluid mechanics in calculations
			Students will be able to analyse the trends depicted by characteristic curves obtained from the experiments
			Students will be able to predict the stability of a floating vessel following the principles of metacentric height and radius of gyration
SEMESTER -IV	EST 200	Design and Engineering	Explain the different concepts and principles involved in design engineering.
			Apply design thinking while learning and practicing engineering.
			Develop innovative, reliable, sustainable and economically viable designs
			incorporating knowledge in engineering.
SEMESTER -IV	HUT 200	Professional Ethics	Understand the core values that shape the ethical behaviour of a professional.
			Adopt a good character and follow an ethical life.
			Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
			Solve moral and ethical problems through exploration and assessment by established experiments.
			Apply the knowledge of human values and social values to contemporary ethical values and global issues.
SEMESTER -IV	MCN 202	CONSTITUTION OF INDIA	Explain the background of the present constitution of India and features.
			Utilize the fundamental rights and duties.
			Understand the working of the union executive, parliament and judiciary.
			Understand the working of the state executive, legislature and judiciary.
			Show national and patriotic spirit as responsible citizens of the country
			Utilize the special provisions and statutory institutions.
	MAT202	Probability, Statistics And Numerical Methods - (MAT202	Understand the concept, properties and important models of discrete random variables
			Understand the concept, properties and important models of continuous random variables.
			Perform statistical inferences concerning characteristics of a population.
			Compute roots of equations, evaluate definite integrals and perform interpolation
			Apply standard numerical techniques for solving systems of equations, fitting curves
SEMESTER -V	MET301	MECHANICS OF MACHINERY	Explain the fundamentals of kinematics, various planar mechanisms and interpret the basic principles of mechanisms and machines
			Perform analysis and synthesis of mechanisms
			Solve the problem on cams and gear drives, including selection depending on requirement.
			Calculate the gyroscopic effect in various situations
			Analyse rotating and reciprocating masses for its unbalance
SEMESTER -V	MET 303	THERMAL ENGINEERING	Explain the working of steam power cycle and related components
			Discuss the working of steam turbines and methods for evaluating the performance
			Illustrate the performance testing and evaluation of IC engines
			Explain the combustion phenomenon and pollution in IC engines
			Discuss the principles of refrigeration and air-conditioning and basic design considerations
SEMESTER -V	MET305	INDUSTRIAL & SYSTEMS ENGINEERING	Implement various tools and techniques in industrial engineering
			Calculate the inventory system for a given requirement
			Explain the importance of industrial relations Select the lean manufacturing tools to find and eliminate wastes
			Select the lean manufacturing tools to find and eliminate wastes
			Identify the framework of agile manufacturing
			Identify core and extended modules of enterprise resource planning
V			Analyze various machining process and calculate relevant quantities such us velocities, forces and powers.
			Analyze of the tool nomenclature with surface roughness obtainable in each machining processes.

SEMESTER - V	MET 307	MACHINE TOOLS AND METROLOGY	Understand the limitations of various machining process with regard to shape formation and surface texture.
			Demonstrate knowledge of the underlying principles of measurement, as they relate to mechanical measurement, electronic instrumentation, and thermal effects.
			Get an exposure to advanced measuring devices and machine tool metrology.
			Apply the procedures to measure length, angles, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by using different instruments and by different indirect methods.
	MEL331	COURSE NAME: MACHINE TOOLS LAB II	Determine limits and fits and allocate tolerances for machine components .
			CNC programming and to use coordinate measuring machine to record measurements of complex profiles with high sensitivity.
			Use effective methods of measuring straightness, Squareness, flatness, roundness, profile, screw threads and gear teeth.
			Securing knowledge of manufacturing components within the tolerance limit and surface roughness according to given drawings using various machine tools.
	MEL333	THERMAL ENGINEERING LAB 1	Measure thermo-physical properties of solid, liquid and gaseous fuels.
			Identify various systems and subsystems of Diesel and petrol engines.
			Analyse the performance characteristics of internal combustion engines
			Investigate the emission characteristics of exhaust gases from IC Engines
			Interpret the performance characteristics of air compressors / blowers
SEMESTER - VI	MET302	HEAT &MASS TRANSFER	Apply principles of heat and mass transfer to engineering problems.
			Analyse and obtain solutions to problems involving various modes of heat transfer.
			Design heat transfer systems such as heat exchangers, fins, radiation shields etc.
			Define laminar and turbulent boundary layers and ability to formulate energy equation in flow systems.
	MET304	DYNAMICS AND DESIGN OF MACHINERY	Do engine force analysis and to draw turning moment diagrams
			Analyse free and forced vibrations of single degree of freedom systems
			Determine the natural frequencies of a two degree of freedom vibrating system and to calculate the stresses in a structural member due to combined loading
			Design machine elements subjected to fatigue loading and riveted joints
			Design welded joint and close coiled helical compression spring
SEMESTER - VI	MET 306	ADVANCED MANUFACTURING ENGINEERING	To be conversant with the advanced machining process and to appreciate the effect of process parameters on the surface integrity aspects during the advanced machining process
			CNC programming, select appropriate tooling and fixtures.
			To categorize the various nontraditional material removal process based on energy sources and mechanism employed.
			Analyze the processes and evaluate the role of each process parameter during micro machining of various advanced material removal processes.
			Explain the processes used in additive manufacturing for a range of materials and applications.
SEMESTER - VI	MET308	COMPREHENSIVE COURSE WORK	Learn to prepare for a competitive examination
			Comprehend the questions in Mechanical Engineering field and answer them with confidence
			Communicate effectively with faculty in scholarly environments
			Analyze the comprehensive knowledge gained in basic courses in the field of Mechanical Engineering
SEMESTER - VI	MET 312	NON DESTRUCTIVE TESTING	Have a basic knowledge of surface NDT which enables to carry out various inspections in accordance with the established procedures.
			The students will be able to differentiate various defect types and select the appropriate NDT methods for the specimen.
			Calibrate the instrument and evaluate the component for imperfections.
			Have a basic knowledge of ultrasonic testing which enables them to perform inspection of samples.
			Have a complete theoretical and practical understanding of the radiographic testing, interpretation and evaluation.
SEMESTER - VI	HUT 310	MANAGEMENT FOR ENGINEERS	Explain the characteristics of management in the contemporary context
			Describe the functions of management
			Demonstrate ability in decision making process and productivity analysis
			Illustrate project management technique and develop a project schedule
			Summarize the functional areas of management
			Comprehend the concept of entrepreneurship and create business plans
	MEL332	MEL332 COMPUTER AIDED DESIGN & ANALYSIS LAI	Gain working knowledge in Computer Aided Design and modelling procedures.
			Gain knowledge in creating solid machinery parts.
			Gain knowledge in assembling machine elements
			Gain working knowledge in Finite Element Analysis.
			Solve simple structural, heat and fluid flow problems using standard software
			Evaluate thermal properties of materials in conduction, convection and radiation.

	MEL334	THERMAL ENGINEERING LAB-II	Analyse the performance of heat exchangers
			Illustrate the operational performances of refrigeration and air conditioning systems
			Perform calibration of thermocouples and pressure gauges
SEMESTER - VII	MET401	DESIGN OF MACHINE ELEMENTS	Design shafts based on strength, rigidity and design for static and fatigue loads, design flat belts and connecting rod of IC engines
			Design clutches and brakes
			Analyse sliding contact bearings and understand design procedure of journal, ball and roller bearings.
			Design Spur gear and helical gear
			Bevel gears and worm gears
	MET473	AIR CONDITIONING AND REFRIGERATION	Explain the basics of refrigeration process
			Analyse the vapour compression refrigeration system and to improve the performance.
			Describe vapour absorption and steam refrigeration system.
			Design refrigeration system by selecting suitable components and environmentally refrigerant
			Evaluate the cooling load and capacity requirement of ac machine
SEMESTER - VII	MET445	RENEWABLE ENERGY ENGINEERING	Explain renewable energy sources and evaluate the implication of renewable energy. To predict solar radiation at a location
			Explain solar energy collectors, storages, solar cell characteristics and applications
			Explain the different types of wind power machines and control strategies of wind turbines
			Explain the ocean energy and conversion devices and different Geothermal sources
			Explain biomass energy conversion devices. Calculate the Net Present value and payback period
	MEL411	MECHANICAL ENGINEERING LAB	Get practical knowledge on design and analysis of mechanisms in the machines.
			Measure the cutting forces associated with milling machining operations.
			Apply the basic concepts of hydraulic and pneumatic actuators and their applications in product and processes
			Use appropriate systems for data acquisition and control of product and processes
SEMESTER - VII	MEQ 413	SEMINAR	Identify academic documents from the literature which are related to her/his areas of interest
			Read and apprehend an academic document from the literature which is related to her/ his areas of interest
			Prepare a presentation about an academic document
			Give a presentation about an academic document
			Prepare a technical report
SEMESTER - VII	MED415	PROJECT PHASE I	Model and solve real world problems by applying knowledge across domains
			Develop products, processes or technologies for sustainable and socially relevant applications
			Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
			Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
			Identify technology/research gaps and propose innovative/creative solutions
			Organize and communicate technical and scientific findings effectively in written and oral forms
	MCN401	INDUSTRIAL SAFETY ENGINEERING	Describe the theories of accident causation and preventive measures of industrial accidents.
			Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping indicators and importance of housekeeping.
			Explain different issues in construction industries
			Describe various hazards associated with different machines and mechanical material handling
			Utilise different hazard identification tools in different industries with theknowledge of different types of chemical hazards.
SEMESTER - VIII	MET476	CRYOGENIC ENGINEERING	Explain the properties of cryogenic liquids and properties of material atcryogenic temperatures
			Describe and analyze cryogenic liquefaction systems using first principles of thermodynamics
			Describe and analyze cryogenics refrigeration using first principles of thermodynamics
			Identify insulation system for cryogenic application and explain cryogenic storage vessels.
			Understand gas separation and purification methods
			Understand instrumentation for various measurements in cryogenic engineering
	MET458	ADVANCED ENERGY ENGINEERING	Explain the concept of various types of power generation
			Explain solar and wind power generation and its economics
			Explain biomass energy sources and its economics
			Explain various renewable energy sources

			Explain environmental impacts of various energy generation
SEMESTER - VIII	MET402	MECHATRONICS	Explain the sensors and actuators used in mechatronics
			Design hydraulic and pneumatic circuits for automation.
			Explain the manufacturing processes used in MEMS
			Demonstrate the various components of a CNC machine
			Create a PLC program
			Explain the robotic sensors and vision system
	MED416	PROJECT PHASE II	Model and solve real world problems by applying knowledge across domains
			Develop products, processes or technologies for sustainable and socially relevant applications
			Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
			Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
			Identify technology/research gaps and propose innovative/creative solutions
			Organize and communicate technical and scientific findings effectively in written and oral forms