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DEPARTMENT OF MECHANICAL ENGINEERING

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COURSE OUTCOMES (COs)

B.Tech III Semester

Course Name: Applied Mathematics – III	**Course Code: BTME301T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Solve ordinary, integral, and integro-differential equations using Laplace Transform.
CO2	Analyze periodic functions with Fourier series and solve integral equations using Fourier Transform.
CO3	Apply differentiation, integration, and expansion of complex functions to evaluate integrals.
CO4	Solve partial differential equations using separation of variables.
CO5	Solve real-world problems using matrices.

Course Name: Manufacturing Processes	**Course Code: BTME302T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Demonstrate pattern making and moulding techniques, and design gating systems with suitable furnaces and casting methods.
CO2	Describe welding processes, types, defects, and their applications.
CO3	Illustrate metal forming processes and the working of rolling machines.
CO4	Explain press working processes, dies, and shaping operations.
CO5	Summarize the properties, applications, and forming methods of plastics, ceramics, and glasses.

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COURSE OUTCOMES (COs)

Course Name: Manufacturing Processes Lab	**Course Code: BTME302P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Apply engineering concepts in manufacturing through hands-on activities.
CO2	Interpret the use and importance of manufacturing techniques in real industries.
CO3	Design gating and riser systems for making defect-free castings.
CO4	Analyze welding settings and materials to make strong welded joints.
CO5	Describe how plastic, glass, and ceramic materials are processed and used in industries.

Course Name: Engineering Thermodynamics	**Course Code: BTME303T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Apply thermodynamic concepts and ideal gas laws to determine energy transfer in terms of heat and work for different processes.
CO2	Evaluate energy interactions in open and closed systems, thermal components, and devices using the first law of thermodynamics.
CO3	Evaluate the performance of heat engines, heat pumps, and refrigerators using the second law of thermodynamics and entropy concepts.
CO4	Analyze steam properties and thermodynamic processes using steam as the working fluid to determine energy transfer in terms of heat and work.
CO5	Compare various power cycles to determine energy transfer and assess their efficiencies.

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COURSE OUTCOMES (COs)

Course Name: Kinematics of Machines	**Course Code: BTME304T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Evaluate motion and forces through kinematic and dynamic analysis. (Displacement,Velocity, acceleration, Inertia forces) of a given mechanism Using analytical and graphical method.
CO2	Generalize concept of compliant mechanisms.
CO3	Contrive or synthesize new mechanisms for specific requirements and Perform computer aided analysis of simple mechanisms.
CO4	Construct cam profiles and analyse the follower motion.
CO5	Distinguish geometry of gear, its types, identify the forces and motions of gear teeth. outline the gear trains and governors.

Course Name: Machine Drawing and Solid Modeling	**Course Code: BTME305P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Describe basic elements of machine drawings like lines, dimensions, tolerances, and symbols.
CO2	Create 2D detailed and sectional views from isometric drawings using standard drafting methods.
CO3	Apply Geometric Dimensioning and Tolerancing (GD&T) principles to make accurate part and assembly drawings.

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COURSE OUTCOMES (COs)

Course Name: Computer Programming	**Course Code: BTME306P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain basic programming concepts such as data types, input/output functions, operators, control structures, and user-defined functions..
CO2	Develop the ability to write optimized, robust, and reusable C programs by applying best practices in coding.
CO3	Apply concepts of data structures such as arrays and structures to implement programs for solving various practical problems.

Course Name: Sports	**Course Code: BTME307P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Apply the importance of physical fitness for well-being.
CO2	Demonstrate team spirit and leadership in group sports.
CO3	Practice ethical behavior, sportsmanship, and fair play.
CO4	Recognize the role of sports in mental health, social responsibility, and sustainable living.
CO5	Communicate effectively and manage events collaboratively in teams.

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COURSE OUTCOMES (COs)

B.Tech IV Semester

Course Name: Machining Processes	**Course Code: BTME401T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain fundamentals of metal cutting
CO2	Describe basic construction and operations of lathe shaping, planning
CO3	Illustrate basics of milling and milling cutters. slotting
CO4	Describe the surface finishing processes.
CO5	Explain the basics of drilling, boring, reaming and broaching.

Course Name: Machining Processes Lab	**Course Code: BTME401P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Describe basic cutting tools.
CO2	Explain Working of lathe and turning operation.
CO3	Demonstrate Shaping and planning operation.
CO4	Illustrate Milling and drilling operation.
CO5	Describe Grinding and surface finishing.

Course Name: Fluid Mechanics & Hydraulic Machines	**Semester:- IV**
Course Code: BTME402T	
COs	**Statement**
At the end of course students will be able to –	
CO1	Classify fluid properties, types of flow, and flow-measuring devices, and explain fluid behavior under rest conditions.
CO2	Explain the behavior of fluids in motion and the application of Bernoulli's equation to flow-measuring devices.
CO3	Apply dimensional analysis for designing hydraulic machines and evaluate fluid losses in pipe flow.
CO4	Classify layouts of hydroelectric power plants and analyze the design characteristics of hydraulic turbines (Pelton, Francis, Propeller, Kaplan).
CO5	Explain the working and design of centrifugal and reciprocating pumps and evaluate similitude and model testing for practical applications.

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COURSE OUTCOMES (COs)

Course Name: Fluid Mechanics & Hydraulic Machines	**Course Code: BTME402P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain what is Stability condition of floating bodies, Law of conservation of Energy.
CO2	Apply Frictional losses and Hydraulic co-efficient in the pipe flow.
CO3	Estimate the Performance characteristics of Pelton Turbine
CO4	Estimate the Performance characteristics of Francis Turbine & Kaplan Turbine.
CO5	Estimate the Performance characteristics of Centrifugal Pump & Reciprocating Pump.

Course Name: Material Science and Engineering	**Course Code: BTME403T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Interpret microstructures and the Iron-Iron Carbide diagram to understand the effect of crystalline structure on metals.
CO2	Classify commercial steels based on their properties and industrial uses.
CO3	Apply suitable heat treatment processes based on material needs.
CO4	Evaluate different types of cast iron and their properties for engineering applications.
CO5	Explain the basics of powder metallurgy and its application in making components.

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COURSE OUTCOMES (COs)

Course Name: Mechanics of Material	**Course Code: BTME404T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the fundamental concepts of various types of loading and the resulting stresses induced in structural members.
CO2	Construct Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for beams under different loading and support conditions
CO3	Estimate strain energy in mechanical elements and analyze deflection in beams using appropriate methods.
CO4	Design shafts subjected to various loading conditions based on strength and stiffness criteria.
CO5	Interpret the theories of failure and evaluate the design of columns and struts for effective load-bearing performance.

Course Name: Material Testing Lab	**Course Code: BTME405P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Analyze the microstructure of ferrous and non-ferrous materials to determine their mechanical properties.
CO2	Apply the principles of tensile and shear forces to real-life engineering problems involving different materials.
CO3	Explain the microstructures of materials and relate them to their functional applications.
CO4	Measure torsional strength and hardness of materials using appropriate testing methods.
CO5	Integrate fundamental material science concepts in the design of engineering components.

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Course Name: Professional Ethics	**Course Code: BTME406T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Illustrate the basic purpose of the profession, professional ethics and various moral and social issues.
CO2	Analyze various moral issues and theories of moral development
CO3	Realize their roles of applying ethical principles at various professional levels
CO4	Identify their responsibilities for safety and risk benefit analysis.
CO5	Interpret their roles in dealing various global issues

Course Name: Sports	**Course Code: BTME407P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Apply the importance of physical fitness for well-being.
CO2	Demonstrate team spirit and leadership in group sports.
CO3	Practice ethical behavior, sportsmanship, and fair play.
CO4	Recognize the role of sports in mental health, social responsibility, and sustainable living.
CO5	Communicate effectively and manage events collaboratively in teams.

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COURSE OUTCOMES (COs)

B.Tech V Semester

Course Name: Heat Transfer	**Course Code: BTME501T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain different modes of heat transfer, calculate thermal resistance and heat transfer through plane and composite walls, cylinders, and spheres, with and without thermal contact resistance.
CO2	Apply the concept of internal heat generation to compute heat transfer in plane walls, cylinders, and spheres; explain the role of various fins and analyze their significance in steady-state conduction; interpret the concept of unsteady-state heat transfer.
CO3	Apply appropriate empirical correlations to estimate forced and natural convection heat transfer for internal and external flows.
CO4	Evaluate radiative heat transfer from ideal and real surfaces, including enclosures of various geometries.
CO5	Evaluate heat exchanger performance based on given conditions and design appropriate heat exchanger geometries to meet specified heat transfer requirements.

Course Name: Heat Transfer Lab	**Course Code: BTME501P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Determine the heat transfer rates through various cross-sections and mediums in different modes.
CO2	Acquire, tabulate, analyze experimental data, and draw interpretation and conclusions.
CO3	Calculate radiation heat transfer and utilize that knowledge in designing any heat transfer application.
CO4	Describe heat exchanger analysis.
CO5	Select the proper heat exchangers per system requirements.

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COURSE OUTCOMES (COs)

Course Name: Energy Conversion-I	**Course Code: BTME502T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Analyze steam generators (boilers), boiler mountings & accessories, and evaluate boiler performance parameters.
CO2	Evaluate fluidized bed boilers, various draught systems, and performance parameters of natural draught systems (chimney).
CO3	Determine the throat area, exit area, and exit velocity of steam nozzles; and compare impulse and reaction turbines including governing methods.
CO4	Analyze compounding methods, energy losses, and velocity diagrams to evaluate blade angles, work done, thrust, power, and turbine efficiencies.
CO5	Classify steam condensers and cooling towers, and evaluate the performance of surface condensers.

Course Name: Design of Machine Elements	**Course Code: BTME503T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Apply principals of static loading for design of Cotter joint, Knuckle joint.
CO2	Design bolted, welded joints, power screws & pressure vessels
CO3	Design the power transmission shaft & coupling
CO4	Analyze components subjected to fatigue and bending stresses in curved beam designs such as crane hooks and C-Frames.
CO5	Design clutches, brakes and springs

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COURSE OUTCOMES (COs)

Course Name: Design of Machine Elements Lab	**Course Code: BTME503P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Design Cotter joint / Knuckle joint / Turn buckle/ crane hook, C-frame
CO2	Design bolted and welded joints, power screw and Cylinder & Pressure Vessels
CO3	Design the shaft, coupling, clutches and brakes
CO4	Design the spring under static and variable loads

Course Name: Industrial Economics & Management	**Course Code: BTME504T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Discuss the concept of demand and supply and demonstrate its relationship with price.
CO2	Identify and classify various factors of production with reference to different economic sectors.
CO3	Analyze the causes and effects of inflation and differentiate between various types of market structures.
CO4	Describe the functions of management and illustrate the principles of marketing management.
CO5	Interpret the concepts of financial management and evaluate their role in business growth.

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COURSE OUTCOMES (COs)

Course Name: Automobile Engineering (Open Elective-I)	**Course Code: BTME505T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Demonstrate the vehicle construction, chassis, fuel supply system, lubrication system and cooling system in automobile.
CO2	Illustrate the principle and working of Transmission system and clutch, gear box, rear axle drives, fluid flywheel, torque converter.
CO3	Identify the steering, suspension system and brake system.
CO4	Discuss the applications of electrical/electronic system of automobile and wheels, tyres.
CO5	Explain the concept of electric vehicles, Hybrid vehicles, fuel cell vehicles and vehicle pollution norms. Appraise the automobile safety system and recent development in automobiles.

Course Name: Industrial Visit	**Course Code: BTME506P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Opportunity to interact with Industry Experts
CO2	Learning experience.
CO3	Enhanced employability and PPO's.
CO4	Interpersonal skills enhancement.
CO5	Day off from the usual melancholy.

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COURSE OUTCOMES (COs)

Course Name: Performing Art	**Course Code: BTME507P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Develop problem-solving skills applicable to real-world scenarios.
CO2	Enhance analytical thinking to assess and interpret various situations effectively.
CO3	Demonstrate effective communication skills suitable for professional and academic environments.
CO4	Apply essential soft skills required for employability in reputed companies.
CO5	Explore diverse career opportunities and make informed decisions for future growth.

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COURSE OUTCOMES (COs)

B.Tech VI Semester

Course Name: Automaton in Production	**Course Code: BTME601T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the types and strategies of automation; analyze assembly line balancing methods and describe work part transport systems.
CO2	Describe the fundamentals and construction of NC, CNC, and DNC machines; develop CNC programs for given components; explain robotic configurations, links, joints, grippers, and classify industrial robots and their applications.
CO3	Describe various automated material handling systems and analyze automated storage and retrieval systems (AGVS, AS/RS).
CO4	Explain automated inspection systems including CAPP, CAQC, and CMM; apply the concept of Group Technology in manufacturing processes.
CO5	Identify the concepts of CAD/CAM, CIM, and FMS; explain the basics of PLC programming and its industrial relevance.

Course Name: Automaton in Production Lab	**Course Code: BTME601P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Recognize automation, corroborating this knowledge with case studies on automation systems. study and analyze the material handling systems, robots and GT
CO2	Demonstrate NC programming (manual/apt)
CO3	Simulate program on CNC milling/ lathe
CO4	Work on CNC milling/ lathe

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COURSE OUTCOMES (COs)

Course Name: Energy Conversion-II	**Course Code: BTME602T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the construction and working of I.C. engines, stages of combustion in SI & CI engines, knocking, supercharging, and fuel supply systems.
CO2	Evaluate the performance parameters of I.C. engines and heat balance sheet.
CO3	Analyze the working of refrigeration systems and problems related to single-stage vapor compression refrigeration cycle.
CO4	Apply the principles of air-conditioning systems to solve problems based on psychrometric properties and processes.
CO5	Compare different types of air compressors and performance parameters of reciprocating air compressors.

Course Name: Energy Conversion Lab	**Course Code: BTME602P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Discuss the different components of I.C. engine, air compressor and Vapour Compression Refrigeration system(VCRS)
CO2	Demonstrate and determine the performance parameters of I.C. engine and preparation of its Heat balance sheet
CO3	Determine B.E, IP, and F.P. by using Morse Test on Multi cylinder C.I. Engine or S.I. Engine
CO4	Demonstrate and determine the performance parameters of Vapour Compression Refrigeration system.
CO5	Analyze the performance parameters of Multistage reciprocating air compressor

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COURSE OUTCOMES (COs)

Course Name: Dynamics of Machines	**Course Code: BTME603T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Comprehend the machine dynamics through basic principles to interpret their application and examine near to life problems due gyroscopic effects and determine the conditions for stability of ships, airplanes and automobile.
CO2	Diagnose dynamic force conditions in planer linkages and cams to determine required driving torque condition (graphically/ analytically).
CO3	Estimate the unbalanced forces due to rotating and reciprocating masses in a mechanical system and calculate (graphically/ analytically) the balancing masses required for safe/ smooth operation of these mechanical systems.
CO4	Identify the requirement of flywheel, brakes, and dynamometers in a mechanical system and calculate inertia of flywheel and braking condition to be incorporated in engines and machines.
CO5	Recognize and interpret the concept of vibration in various mechanical systems and distinguish vibration characteristics for 1 & 2 DOF systems to evaluate the conditions for its control/ use.

Course Name: Dynamics of Machines	**Course Code: BTME603P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Demonstrate the concept of gyroscopic effect through the working model.
CO2	Analyze the performance of mechanisms and Perform dynamic force analysis of linkages and cams.
CO3	Demonstrate record and interpret data of vibration characteristics of mechanical vibratory systems.
CO4	Perform analysis of brakes, dynamometers and flywheels.
CO5	Identify the importance of safety, team work and effective communication for conduction of activity.

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COURSE OUTCOMES (COs)

Course Name: Operation Research (Elective-I)	**Course Code: BTME604T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Formulate real-world problems into mathematical models and synthesize optimal solutions using algorithms like simplex or dynamic programming.
CO2	Apply Operations Research models to solve practical problems such as production scheduling or logistics optimization.
CO3	Optimize project parameters using CPM/PERT techniques and analyze trade-offs to ensure efficient resource allocation.
CO4	Evaluate equipment replacement strategies by comparing maintenance costs, depreciation, and performance metrics to justify optimal replacement intervals.
CO5	Design simulation models to test system behavior under varying conditions and propose data-driven improvements.

Course Name:Advanced Manufacturing Techniques (Elective II) **Course Code: BTME605T**	
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain Non-Traditional Machining processes along with their need, economics, applications, historical development, and the basics of High-Speed Grinding, Hot and Cold Machining.
CO2	Illustrate the working principles of Abrasive Jet Machining (AJM), Ultrasonic Machining, and Water Jet Machining.
CO3	Describe the principles and operations of Electrochemical Machining (ECM), Electrochemical Grinding (ECG), Electric Discharge Machining (EDM), Electron Beam Machining (EBM), Laser Beam Machining (LBM), and Plasma Arc Machining (PAM).
CO4	Explain the fundamentals of Unconventional Welding Techniques and Solid Phase Welding Techniques.
CO5	Describe the basic principles of Advanced Casting Processes.

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COURSE OUTCOMES (COs)

Course Name: Skill Development	**Course Code: BTME606P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Apply the principles of mathematics, science, and engineering to solve mechanical engineering problems.
CO2	Analyze experimental data by designing experiments, conducting tests, and interpreting results.
CO3	Design mechanical systems, components, or processes considering global, societal, and ethical aspects.
CO4	Demonstrate effective teamwork and communication skills in multidisciplinary engineering environments.
CO5	Utilize modern engineering tools and contemporary techniques for professional practice and life-long learning in thermal and mechanical domains.

Course Name: Summer Internship	**Course Code: BTME607P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the real-world professional environment gained through internship exposure.
CO2	Develop effective networking skills by interacting with industry professionals.
CO3	Reflect on personal strengths, interests, and areas of improvement through internship experiences.
CO4	Demonstrate workplace-relevant technical and non-technical skills acquired during the internship.
CO5	Enhance employability by applying internship learning to gain a competitive advantage.

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COURSE OUTCOMES (COs)

Course Name: Environment Science	**Course Code: BTME608T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the importance of environmental studies, natural resources, and public awareness for sustainable development.
CO2	Differentiate renewable and non-renewable resources and justify the role of individuals in their conservation for sustainable living.
CO3	Analyze ecosystem structure, functions, ecological cycles, succession, and food relationships within various ecosystem types.
CO4	Evaluate biodiversity at different levels, its values, threats, and methods of conservation with reference to India's mega-diverse status.
CO5	Assess various types of pollution, solid waste management practices, and disaster management measures to minimize environmental hazards.

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COURSE OUTCOMES (COs)

B.Tech VII Semester

Course Name: Industrial Engineering	**Course Code: BEME701T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the concepts of productivity, work study, method study, and motion study using various tools such as process charts, string diagrams, and SIMO charts.
CO2	Apply work measurement techniques and ergonomics principles to improve workplace design and human–machine performance.
CO3	Use forecasting techniques such as time series, moving averages, least squares, and exponential smoothing for industrial planning and decision-making.
CO4	Analyze maintenance strategies, reliability data, and system configurations (series, parallel, standby) to enhance equipment performance.
CO5	Evaluate quality control concepts, process control charts, sampling methods, and inspection strategies for improving product conformance.
CO6	Assess statistical quality control techniques, quality auditing, vendor rating, TQM, ISO standards, and Six Sigma approaches for continuous quality improvement.

Course Name: Automobile Engineering (Elective-I)	**Course Code: BEME702T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the evolution of automobiles, chassis layouts, vehicle frames, power plant types, and associated fuel, cooling, and lubrication systems.
CO2	Describe the construction, working, and types of clutches and transmission systems including gearboxes, torque converters, and automatic transmissions.
CO3	Analyze transmission components such as propeller shafts, differentials, axles, and braking systems to understand vehicle power flow and braking performance.
CO4	Illustrate steering geometry, steering linkages, wheel alignment, and various suspension systems used for ride comfort and vehicle control.
CO5	Examine automobile electrical systems, ignition systems, air-conditioning, wheels, and tyres to ensure proper vehicle operation and safety.
CO6	Evaluate modern automotive technologies, safety features, body design considerations, and recent advancements such as ABS, EPS, EBD, and collision-avoidance systems.

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COURSE OUTCOMES (COs)

Course Name: Power Plant Engineering (Elective-I)	**Course Code: BEME702T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the fundamentals of energy sources, fluctuating loads, tariffs, and economic analysis related to power generation.
CO2	Analyze steam power cycles including Rankine cycle, regeneration, reheating, combined cycles, and cogeneration systems.
CO3	Describe coal properties, combustion systems, steam generators, boiler components, and pollution control systems used in thermal power plants.
CO4	Illustrate hydrological concepts, hydroelectric plant components, site selection, and prime movers to assess hydro power generation.
CO5	Evaluate nuclear power generation principles, reactor types, energy release, and nuclear waste disposal methods.
CO6	Compare gas turbine, diesel, and emerging renewable power generation technologies such as solar, fuel cells, wind, and ocean energy systems.

Course Name: Computer Aided Design (Elective – III)	**Course Code: BEME703T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the fundamentals of CAD, rasterization methods, frame buffers, and algorithms for generating basic geometric entities.
CO2	Apply 2D and 3D geometric transformations, windowing, clipping, and homogeneous representation to manipulate graphical objects.
CO3	Analyze geometric and solid modeling techniques including Bezier, B-spline curves, CSG, B-rep, and assembly modeling concepts.
CO4	Formulate one-dimensional finite element models using energy and weighted residual methods, and derive element equations for various boundary conditions.
CO5	Develop finite element formulations for truss and two-dimensional CST elements and perform pre-processing and post-processing for engineering problems.
CO6	Evaluate optimization objectives, design equations, and Johnson's method to obtain optimal engineering designs under normal and redundant specifications.

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COURSE OUTCOMES (COs)

Course Name: Computer Aided Design (Elective – III)	**Course Code: BEME703P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Develop algorithms to construct geometric entities and generate corresponding computer programs.
CO2	Analyze engineering problems by developing finite element models, applying boundary and loading conditions, and solving them using analysis software.
CO3	Write computer programs to perform 2D and 3D transformations on geometric objects.
CO4	Generate 2D and 3D geometric models of engineering objects using construction and modification commands in CAD software.

Course Name: Energy Conversion–II	**Course Code: BEME704T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the construction, working, and performance analysis of reciprocating air compressors.
CO2	Illustrate the construction, operation, and performance characteristics of rotary and centrifugal air compressors.
CO3	Describe the components of internal combustion engines along with combustion phenomena and fuel-injection systems.
CO4	Analyze engine performance parameters, heat balance sheets, and characteristics of multi-cylinder I.C. engines.
CO5	Explain the working of VCRS, VARS, refrigerant nomenclature, and air refrigeration systems.
CO6	Evaluate air-conditioning systems using psychrometric properties, comfort parameters, and bypass factor to determine human comfort.

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COURSE OUTCOMES (COs)

Course Name: Energy Conversion–II	**Course Code: BEME704P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Conduct performance tests on reciprocating, rotary, and multicylinder I.C. engines to evaluate their operating characteristics.
CO2	Demonstrate the construction, working, and components of internal combustion engines, including fuel injection, ignition, cooling, and lubrication systems.
CO3	Analyze exhaust emissions, heat balance sheets, and Morse test results to assess engine performance and efficiency.
CO4	Evaluate the performance of VCRS, VARS, and air-conditioning systems using psychrometric processes and refrigeration test setups.

Course Name: Design of Mechanical Drives	**Course Code: BEME705T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Design mechanical power-transmitting elements such as couplings, flywheels, and bearings considering stresses, lubrication principles, and functional requirements.
CO2	Analyze belt, chain, and wire-rope drives to determine tensions, power transmission capability, and design parameters for safe and efficient operation.
CO3	Develop gear designs for spur, helical, and bevel gear drives using gear geometry, force analysis, and failure considerations.
CO4	Evaluate worm gear drives and I.C. engine components by applying design standards, force analysis, wear criteria, and appropriate material selection.

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COURSE OUTCOMES (COs)

Course Name: Design of Mechanical Drives	**Course Code: BEME705P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Design mechanical components such as flywheels, couplings, bearings, belt drives, chain drives, wire ropes, and gears using standard design procedures.
CO2	Select suitable antifriction bearings, materials, and design parameters for various mechanical elements based on performance requirements and failure considerations.
CO3	Analyze I.C. engine components and power-transmission systems to determine stresses, loads, and design constraints for reliable operation.
CO4	Prepare an assembly design report and complete assembly drawings for mechanical systems consisting of multiple elements.

Course Name: Project Seminar	**Course Code: BEME706P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Identify and define a real-world engineering problem through literature survey and gap analysis.
CO2	Formulate project objectives, scope, and methodology.
CO3	Apply mechanical engineering fundamentals to develop a conceptual solution/design.
CO4	Demonstrate teamwork, planning, and time management skills.
CO5	Prepare and present a structured technical report.

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COURSE OUTCOMES (COs)

B.Tech VIII Semester

Course Name: Industrial Management	**Course Code: BEME801T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the fundamental principles and functions of management and illustrate their application in organizational operations.
CO2	Describe the concepts of personnel management and analyze manpower planning, recruitment, labor welfare, and industrial relations practices.
CO3	Apply marketing management concepts to evaluate market research, marketing mix, product life cycle, and promotion strategies.
CO4	Analyze financial management tools such as cost estimation, budgeting, break-even analysis, and financial statements for effective decision-making.
CO5	Examine plant location, layout, material handling systems, industrial safety principles, and production types to ensure efficient plant management.
CO6	Assess modern trends in production and operations management such as Lean Manufacturing, SCM, JIT, Kaizen, and BPR to enhance productivity and quality.

Course Name: Industrial Fluid Power (Elective-II)	**Course Code: BEME802T3**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the components, properties of fluids, hydraulic fluids, seals, filters, and contamination control used in fluid power systems.
CO2	Analyze various hydraulic pumps, accumulators, and intensifiers for their suitability in fluid power applications.
CO3	Interpret the construction, working, and symbols of pressure, direction, and flow control valves.
CO4	Calculate actuator parameters such as piston velocity and thrust for hydraulic applications.
CO5	Design hydraulic circuits including meter-in, meter-out, bleed-off, sequencing, and synchronization circuits.
CO6	Compare hydraulic and pneumatic systems along with their valves, actuators, and accessories.

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COURSE OUTCOMES (COs)

Course Name: Industrial Fluid Power (Elective-II)	**Course Code: BEME802P3**
COs	**Statement**
At the end of course students will be able to –	
CO1	Demonstrate the working of hydraulic and pneumatic valves, actuators, and basic control circuits.
CO2	Construct hydraulic and pneumatic circuits such as meter-in, meter-out, sequencing, speed control, and machine tool circuits.
CO3	Analyze troubleshooting procedures and performance issues in hydraulic and pneumatic systems.
CO4	Select appropriate components for simple hydraulic and pneumatic circuits based on functional requirements or case studies.

Course Name: Advanced Manufacturing Techniques (Elective – III) **Course Code: BEME803T1**	
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the need, classification, development, and applications of non-traditional machining processes.
CO2	Analyze the mechanics, process parameters, and machining characteristics of AJM, USM, and WJM processes.
CO3	Compare various electro-chemical and thermal energy–based machining processes such as ECM, ECG, EDM, EBM, LBM, and PAM.
CO4	Describe unconventional welding techniques including MIG/TIG, resistance welding, laser, electron beam, and plasma arc welding.
CO5	Evaluate solid-phase welding processes such as ultrasonic welding and friction welding with respect to applications and economics.
CO6	Identify advanced casting processes such as metal mold casting, continuous casting, squeeze casting, evaporative pattern casting, and ceramic shell casting.

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COURSE OUTCOMES (COs)

Course Name: Automation In Production	**Course Code: BEME804T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain the concepts of automation, automated flow lines, work-part transport, buffer storage, and line balancing techniques.
CO2	Demonstrate the fundamentals of numerical control systems, coordinate systems, part programming, APT programming, and CNC/Adaptive control applications.
CO3	Describe robot anatomy, specifications, end effectors, sensors, robot programming, and industrial robot applications.
CO4	Analyze automated material handling systems, AGVS types, guidance, routing, AS/RS systems, and carousel storage systems.
CO5	Evaluate automated inspection methods, CMM systems, machine vision techniques, and group technology concepts including part families and cell design.
CO6	Compare computer-aided manufacturing, flexible manufacturing systems, and computer-aided process planning approaches.

Course Name: Automation In Production	**Course Code: BEME804P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Operate CNC lathe and CNC milling machines through simulation and practical execution of complex geometries.
CO2	Develop manual part programs and APT-based programs for NC/CNC machining operations.
CO3	Analyze automated systems, robotic applications, and industrial case studies related to automation and NC systems.
CO4	Classify parts using Group Technology and coding systems for manufacturing applications.

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COURSE OUTCOMES (COs)

Course Name: Energy Conversion-III	**Course Code: BEME805T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Explain gas turbine cycles, efficiencies, performance factors, intercooling, reheating, regeneration, and combined power cycles.
CO2	Describe the working principles and efficiencies of turbojet, turboprop, ramjet, pulsejet engines, and the basic features of nuclear power plants.
CO3	Discuss solar energy collection methods, solar geometry, collectors, energy storage, photovoltaic systems, fuel cells, wind generators, and MHD systems.
CO4	Analyze the need, types, procedures, instruments, and economic evaluation tools used in energy auditing.
CO5	Interpret the components, valves, actuators, and circuits used in hydraulic power systems.
CO6	Compare pneumatic systems with hydraulic systems, and study compressors, air preparation units, valves, and pneumatic circuits.

Course Name: Energy Conversion-III	**Course Code: BEME805T**
COs	**Statement**
At the end of course students will be able to –	
CO1	Demonstrate the working of gas turbines, jet propulsion systems, solar lighting systems, and energy-saving techniques.
CO2	Identify various hydraulic pumps, valves, actuators, and industrial hydraulic circuits.
CO3	Analyze energy conservation opportunities in industrial systems through case studies.
CO4	Examine pneumatic compressors, air preparation units, and industrial pneumatic circuits.

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COURSE OUTCOMES (COs)

Course Name: Project	**Course Code: BEME806P**
COs	**Statement**
At the end of course students will be able to –	
CO1	Implement the proposed design/solution using appropriate tools, techniques, and engineering practices.
CO2	Analyze the performance of the developed system/product using experimental or simulation methods.
CO3	Evaluate the results with respect to design objectives, constraints, and standards to ensure effectiveness and feasibility.
CO4	Demonstrate professional skills including teamwork, project management, ethics, and communication during project execution.
CO5	Present the project outcomes through a comprehensive report, technical paper/poster, and viva-voce.