

BTMEC Engineering Graphics

Course Outcomes:

CO1	Sketch the conic sections, special curves, and draw orthographic views from pictorial views and models.
CO2	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.
CO3	sketch the projections of simple solids like prisms, pyramids, cylinder and cone and obtain the traces of plane figures

BTMEC302 Material Science and Metallurgy

Course Outcomes:

CO1	Study various crystal structures of materials
CO2	Understand mechanical properties of materials and calculations of same using appropriate equations
CO3	Evaluate phase diagrams of various materials
CO4	Suggest appropriate heat treatment process for a given application
CO5	Prepare samples of different materials for metallography
CO6	Recommend appropriate NDT technique for a given application

BTMEC303 Fluid Mechanics

Course Outcomes:

CO1	Define fluid, define and calculate various properties of fluid
CO2	Calculate hydrostatic forces on the plane and curved surfaces and explain stability of floating bodies
CO3	Explain various types of flow. Calculate acceleration of fluid particles
CO4	Apply Bernoulli's equation and Navier-Stokes equation to simple problems in fluid mechanics
CO5	Explain laminar and turbulent flows on flat plates and through pipes
CO6	Explain and use dimensional analysis to simple problems in fluid mechanics
CO7	Understand boundary layer, drag and lift

BTMEC304 Machine Drawing and Computer Aided Drafting

Course Outcomes:

CO1	Interpret the object with the help of given sectional and orthographic views.
CO2	Construct the curve of intersection of two solids
CO3	Draw machine element using keys, cotter, knuckle, bolted and welded joint

CO4	Assemble details of any given part. i. e. valve, pump , machine tool part etc.
CO5	Represent tolerances and level of surface finish on production drawings
CO6	Understand various creating and editing commands in Auto Cad

BTMEC305 Thermodynamics

Course Outcomes:

CO1	Define the terms like system, boundary, properties, equilibrium, work, heat, ideal gas, entropy etc. used in thermodynamics.
CO2	Study different laws of thermodynamics and apply these to simple thermal systems like balloon, piston-cylinder arrangement, compressor, pump, refrigerator, heat exchanger, etc. to study energy balance.
CO3	Study various types of processes like isothermal, adiabatic, etc. considering system with ideal gas and represent them on p-v and T-s planes.
CO4	Apply availability concept to non-flow and steady flow type systems.
CO5	Represent phase diagram of pure substance (steam) on different thermodynamic planes like p-v, T-s, h-s, etc. Show various constant property lines on them.

BTHM3401 Basic Human Rights

Course Outcomes:

CO1	Understand the history of human rights.
CO2	Learn to respect others caste, religion, region and culture.
CO3	Be aware of their rights as Indian citizen.
CO4	Understand the importance of groups and communities in the society.
CO5	Realize the philosophical and cultural basis and historical perspectives of human rights.
CO6	Make them aware of their responsibilities towards the nation.

BTMEL308 Fluid Mechanics Lab

Course Outcomes:

CO1	Understand laminar and Turbulent flow and determine Critical Reynolds number using Reynolds Apparatus
CO2	Verify Bernoulli's theorem
CO3	Determine pressure drop in flow through pipes and pipe fittings
CO4	Verify momentum equation using impact of jet apparatus
CO5	Determine viscosity using viscometer
CO6	Do calibration of pressure gauges, rotameter

CO7	Use manometers for pressure measurement
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**BTMEL309 Machine Drawing and Computer Aided Drafting
Lab**

Course Outcomes:

CO1	Draw Conventional representation of standard machine components, welds, material etc.
CO2	Draw sectional view of a given machine component.
CO3	Develop Assemble view from details of given component i.e. valve, pump, machine tool part, etc.
CO4	Combine details of given machine component and draw assembled view.
CO5	Use various Auto-Cad commands to draw orthographic projection
CO6	Draw sectional view from pictorial view of given machine component using Auto-Cad

BTMEC401 Manufacturing Processes-I

Course Outcomes:

CO1	Identify castings processes, working principles and applications and list various defects in metal casting
CO2	Understand the various metal forming processes, working principles and applications
CO3	Classify the basic joining processes and demonstrate principles of welding, brazing and soldering.
CO4	Study center lathe and its operations including plain, taper turning, work holding devices and cutting tool.
CO5	Understand milling machines and operations, cutters and indexing for gear cutting.
CO6	Study shaping, planing and drilling, their types and related tooling's

BTMEC402 Theory of Machines- I

Course Outcomes:

CO1	Define basic terminology of kinematics of mechanisms
CO2	Classify planar mechanisms and calculate its degree of freedom

CO3	Perform kinematic analysis of a given mechanism using ICR and RV methods
CO4	Perform kinematic analysis of a given mechanism analytically using vector or complex algebra method
CO5	Perform kinematic analysis of slider crank mechanism using Klein's construction and analytical approach

BTMEC403 Strength of Materials

Course Outcomes:

CO1	State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E, μ , etc.
CO2	Recognize the stress state (tension, compression, bending, shear, etc.) and calculate the value of stress developed in the component in axial/eccentric static and impact load cases.
CO3	Distinguish between uniaxial and multiaxial stress situation and calculate principal stresses, max. shear stress, their planes and max. normal and shear stresses on a given plane.
CO4	Analyze given beam for calculations of SF and BM
CO5	Calculate slope and deflection at a point on cantilever /simply supported beam using double integration, Macaulay's, Area-moment and superposition methods
CO6	Differentiate between beam and column and calculate critical load for a column using Euler's and Rankine's formulae

BTMEC404 Numerical Methods in Mechanical Engineering

Course Outcomes: :

CO1	Describe the concept of error
CO2	Illustrate the concept of various Numerical Techniques
CO3	Evaluate the given Engineering problem using the suitable Numerical Technique
CO4	Develop the computer programming based on the Numerical Techniques

BTID405 Product Design Engineering - I

Course Outcomes:

- Create simple mechanical designs
- Create design documents for knowledge sharing
- Manage own work to meet design requirements
- Work effectively with colleagues

BTBSE406A Physics of Engineering Materials**Course Outcomes:**

CO1	Understand the different types of structures of solid, defects in solids and analysis of crystal structure by X-ray diffraction technique.
CO2	Understand the origin and types of magnetism, significance of hysteresis loop in different magnetic materials and their uses in modern technology
CO3	Understand the band structure of solids and conductivity, categorization of solids on the basis of band structure, significance of Fermi-Dirac probability functions
CO4	Understand the principles of superconductivity, their uses in modern technology
CO5	Understand the position of Fermi level in intrinsic and extrinsic semiconductors, Semiconductor conductivity
CO6	Understand the electric field in dielectric
CO7	Understand basics of Nano materials, synthesis methods and characterization techniques

BTBSE3405A Advanced Engineering Chemistry**Course Outcomes: :**

CO1	Classify and explain various types of Corrosion and should apply methods to minimize the rate of corrosion.
CO2	Understand and apply the concepts of Photochemical and Thermal reactions.
CO3	Understand the basic concepts of Polymers, Polymerization and Moulding techniques; Determine molecular weight of High-Polymers.
CO4	Understand and apply the basic techniques in Chemistry and capable to explain the

	concepts of Solvent Extraction.
CO5	Understand and apply various types of Spectroscopic, Chromatographic techniques and also able to explain the concepts of Thermo-Gravimetric Analysis (TGA).

BTHM3402 Interpersonal Communication Skill & Self Development

Course Outcomes:

CO1	Acquire interpersonal communication skills
CO2	Develop the ability to work independently.
CO3	Develop the qualities like self-discipline, self-criticism and self-management.
CO4	Have the qualities of time management and discipline.
CO5	Present themselves as an inspiration for others
CO6	Develop themselves as good team leaders

BTMEL407 Manufacturing Processes Lab-I

Course Outcomes: At the end of the course, students will be able to:

CO1	Perform plain turning, step turning, knurling, eccentric turning, chamfering and facing operations on lathe.
CO2	Prepare setup and fabricate composite job using milling, shaping and drilling machine.
CO3	Making spur gears on a milling machine.
CO4	Prepare sand casting setup using split pattern for simple component.
CO5	Perform joining of two plate using TIG/MIG welding.
CO6	Demonstrate cutting of a sheet metal using flame cutting.

BTMEL408 Theory of Machines Lab-I

Course Outcomes:

CO1	Perform graphically kinematic analysis of any planar mechanism using ICR and RV methods.
CO2	Perform graphically kinematic analysis of slider crank mechanism using Klein's construction.
CO3	Demonstrate use of graphical differentiation method for kinematic analysis of slider crank mechanism or any other planar mechanism with a slider.
CO4	Sketch polar diagram for a Hooke's joint.

Semester - V

BTMEC501 Heat Transfer

Course Outcomes:

CO1	Explain the laws of heat transfer and deduce the general heat conduction equation and to explain it for 1-D steady state heat transfer in regular shape bodies
CO2	Describe the critical radius of insulation, overall heat transfer coefficient, thermal conductivity and lumped heat transfer
CO3	Interpret the extended surfaces
CO4	Illustrate the boundary layer concept, dimensional analysis, forced and free convection under different conditions
CO5	Describe the Boiling heat transfer, mass transfer and Evaluate the heat exchanger and examine the LMTD and NTU methods applied to engineering problems
CO6	Explain the thermal radiation black body, emissivity and reflectivity and evaluation of view factor and radiation shields

BTMEC502 Applied Thermodynamics - I

Course Outcomes:

CO1	Define the terms like calorific value of fuel, stoichiometric air-fuel ratio, excess air, equivalent evaporation, boiler efficiency, etc. Calculate minimum air required for combustion of fuel.
CO2	Study and Analyze gas power cycles and vapour power cycles like Otto, Diesel, dual, Joule and Rankine cycles and derive expressions for the performance parameters like thermal efficiency, P_m
CO3	Classify various types of boiler, nozzle, steam turbine and condenser used in steam power plant.
CO4	Classify various types of IC engines. Sketch the cut section of typical diesel engine and label its components. Define the terms like TDC, BDC, r_c , etc.

CO5	Draw P-v diagram for single-stage reciprocating air compressor, with and without clearance volume, and evaluate its performance. Differentiate between reciprocating and rotary air compressors.
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BTMEC503 Machine Design - I

Course Outcomes:

CO1	Formulate the problem by identifying customer need and convert into design specification
CO2	Understand component behavior subjected to loads and identify failure criteria
CO3	Analyze the stresses and strain induced in the component
CO4	Design of machine component using theories of failures
CO5	Design of component for finite life and infinite life when subjected to fluctuating Load
CO6	Design of components like shaft, key, coupling, screw and spring

BTMEC504 Theory of Machines - II

Course Outcomes:

CO1	Identify and select type of belt and rope drive for a particular application
CO2	Evaluate gear tooth geometry and select appropriate gears, gear trains
CO3	Define governor and select/suggest an appropriate governor
CO4	Characterize flywheels as per engine requirement
CO5	Understand gyroscopic effects in ships, aeroplanes, and road vehicles.
CO6	Understand free and forced vibrations of single degree freedom systems

BTMEC505 Metrology and Quality Control

Course Outcomes:

CO1	Identify techniques to minimize the errors in measurement
CO2	Identify methods and devices for measurement of length, angle, and gear and thread parameters, surface roughness and geometric features of parts.
CO3	Choose limits for plug and ring gauges.
CO4	Explain methods of measurement in modern machineries

CO5	Select quality control techniques and its applications
CO6	Plot quality control charts and suggest measures to improve the quality of product and reduce cost using Statistical tools.

BTMEC506A Automobile Engineering

Course Outcomes:

CO1	Identify the different parts of the automobile.
CO2	Explain the working of various parts like engine, transmission, clutch, brakes etc.,
CO3	Demonstrate various types of drive systems.
CO4	Apply vehicle troubleshooting and maintenance procedures.
CO5	Analyze the environmental implications of automobile emissions. And suggest suitable regulatory modifications.
CO6	Evaluate future developments in the automobile technology.

BTMEC506B Nanotechnology

Course Outcomes:

CO1	Demonstrate the understanding of length scales concepts, nanostructures and nanotechnology.
CO2	To impart basic knowledge on various synthesis and characterization techniques involved in Nanotechnology
CO3	To educate students about the interactions at molecular scale
CO4	Evaluate and analyze the mechanical properties of bulk nanostructured metals and alloys, Nano-composites and carbon nanotubes.
CO5	To make the students understand about the effects of using nanoparticles over conventional methods

BTMEC506C Energy Conservation and Management

Course Outcomes:

CO1	Understand energy problem and need of energy management
CO2	Carry out energy audit of simple units
CO3	Study various financial appraisal methods
CO4	Analyse cogeneration and waste heat recovery systems
CO5	Do simple calculations regarding thermal insulation and electrical energy conservation

BTMEL507 Heat Transfer Lab

Course Outcomes:

CO1	Understand the various heat transfer mode of heat transfer and its application and Verify
CO2	Learn the experimental methodology
CO3	Describe the concept the terms like least count, calibration of the instruments

BTMEL508 Applied Thermodynamics Lab**Course Outcomes:**

CO1	Conduct test on Bomb calorimeter, nozzle, steam turbine, condenser, compressor etc. to study their performance.
CO2	Draw performance curves of these machines.
CO3	Analyze the results obtained from the tests.
CO4	Draw conclusions based on the results of the experiments
CO5	Based on your visit to Industry, sketch its layout and write specifications.

BTMEL509 Machine Design Practice - I**Course Outcomes:**

CO1	Apply design process to an open ended problem
CO2	Determine suitable material and size for structural component of machine/system
CO3	Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing
CO4	Choose logically and defend selection of design factors
CO5	Design of components for given part/system i.e. shaft, keys, coupling, links, screws, springs etc.
CO6	Work effectively as a part of design group/team
CO7	Have good communication skill, orally, graphically as well as in writing

BTMEL510 Theory of Machines Lab - II**Course Outcomes:**

CO1	Explain various types of gear boxes, gear trains, belt and rope drives
CO2	Interpreting physical principles and phenomenon of governor, gyroscopic, flywheel
CO3	Measure vibration parameters in single degree of freedom systems
CO4	Evaluating natural frequency of 1 dof

Semester - VI

BTMEC601 Manufacturing Processes - II

Course Outcomes:

CO1	Understand the process of powder metallurgy and its applications
CO2	Calculate the cutting forces in orthogonal and oblique cutting
CO3	Evaluate the machinability of materials
CO4	Understand the abrasive processes
CO5	Explain the different precision machining processes
CO6	Design jigs and fixtures for given application

BTMEC602 Machine Design - II

Course Outcomes:

CO1	Define function of bearing and classify bearings.
CO2	Understanding failure of bearing and their influence on its selection.
CO3	Classify the friction clutches and brakes and decide the torque capacity and friction disk parameter.
CO4	Select materials and configuration for machine element like gears, belts and chain
CO5	Design of elements like gears, belts and chain for given power rating
CO6	Design thickness of pressure vessel using thick and thin criteria

BTMEC603 Applied Thermodynamics – II

Course Outcomes:

CO1	Apply first law of thermodynamics for closed systems and flow process. Produce TDS relations from Maxwell's relations.
CO2	Calculate thermal efficiencies of heat engine.
CO3	Calculate work done and heat transfer for flow and non-flow process.
CO4	Calculate properties of air vapor mixture using mathematical knowledge and psychrometric chart.

BTMEC604A Engineering Tribology

Course Outcomes:

CO1	Understand the basic concepts and importance of tribology.
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CO2	Evaluate the nature of engineering surfaces, their topography and surface characterization techniques
CO3	Analyze the basic theories of friction and frictional behavior of various materials
CO4	Select a suitable lubricant for a specific application
CO5	Compare different wear mechanisms
CO6	Suggest suitable material combination for tribological design.

BTMEC604B IC Engines

Course Outcomes:

CO1	Explain fuel injection systems in SI engine, types of combustion chamber and combustion process.
CO2	Explain different types of fuel injection system and combustion chambers of CI engine.
CO3	Explain the mechanism of pollution formation and the evolution of emission norms.
CO4	Describe the properties of various alternative fuels, engine modification required and emission characteristic of alternative fuels
CO5	Discuss various ignition methods used in I.C engine and electronic engine management system.

BTMEC604C Additive Manufacturing

Course Outcomes:

CO1	Understand the importance of Additive Manufacturing
CO2	Classify the different AM processes
CO3	Design for AM processes
CO4	Understand the applications of AM
CO5	Differentiate the post processing processes

BTMEC604D Mechanical Measurements

Course Outcomes:

CO1	Define measurement parameters, and Identify errors in measurement
CO2	Identify methods and devices for measurement of length, angle
CO3	Identify methods and devices for measurement of pressure, flow, force, torque, strain, velocity, displacement, acceleration, temperature

BTMEC605A Quantitative Techniques in Project Management

Course Outcomes: :

CO1	Define and formulate research models to solve real life problems for allocating limited resources by linear programming.
CO2	Apply transportation and assignment models to real life situations.
CO3	Apply queuing theory for performance evaluation of engineering and management systems.
CO4	Apply the mathematical tool for decision making regarding replacement of items in real life.
CO5	Determine the EOQ, ROP and safety stock for different inventory models.
CO6	Construct a project network and apply CPM and PERT method.

BTMEC605B Sustainable Development

Course Outcomes:

CO1	Explain the difference between development and sustainable development
CO2	Explain challenges of sustainable development and climate change
CO3	Explain sustainable development indicators
CO4	Analyze sustainable energy options
CO5	Understand social and economic aspects of sustainable development

BTMEC Power Plant Engineering

Course Outcomes:

CO1	Explain the various subsystems of coal power plant and calculate the efficiency of Rankine cycle.
CO2	Discuss the merits & demerits of combined power plants and calculate the efficiency of gas power cycles Differentiate pressurized water reactor & boiling water reactor and explain the various waste disposal system in nuclear power plant
CO3	Explain the working principle of various renewable energy power plants.
CO4	Explain the different tariff procedures for energy consumption and differentiate fixed and operating costs involved in power production.
CO5	

BTMEC605C Renewable Energy Sources

Course Outcomes:

CO1	Explain the difference between renewable and non-renewable energy
CO2	Describe working of solar collectors
CO3	Explain various applications of solar energy
CO4	Describe working of other renewable energies such as wind, biomass

BTMEC606A Biology for Engineers

Course Outcomes:

CO1	Explain origin of life and Evolution, Cells, Biomolecules-Lipids
CO2	Understand Biomolecules
CO3	Understand Cell structure and function and cell cycle
CO4	Explain Mendelian genetics
CO5	Understand and Explain DNA structure, DNA replication, Transcription, Translation

BTMEC606B Solar Energy**Course Outcomes:**

CO1	Describe measurement of direct, diffuse and global solar radiations falling on horizontal and inclined surfaces.
CO2	Analyze the performance of flat plate collector, air heater and concentrating type collector.
CO3	Understand test procedures and apply these while testing different types of collectors.
CO4	Study and compare various types of thermal energy storage systems.
CO5	Analyze payback period and annual solar savings due to replacement of conventional systems.
CO6	Design solar water heating system for a few domestic and commercial applications.

BTMEC606C Human Resource Management**Course Outcomes:**

CO1	Describe trends in the labour force composition and how they impact human resource management practice.
CO2	Discuss how to strategically plan for the human resources needed to meet organizational goals and objectives.
CO3	Define the process of job analysis and discuss its importance as a foundation for human resource management practice
CO4	Explain how legislation impacts human resource management practice.
CO5	Compare and contrast methods used for selection and placement of human resources.
CO6	Describe the steps required to develop and evaluate an employee training program
CO7	Summarize the activities involved in evaluating and managing employee performance.

CO8	Identify and explain the issues involved in establishing compensation systems.
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BTMEL607 Metrology and Quality Control Lab

Course Outcomes:

CO1	Measure linear, angular circular features, dimensional and geometric features
CO2	Measure surface roughness of components
CO3	Calibration of metrological equipment

BTMEL608 Machine Design Practice - II

Course Outcomes:

CO1	Apply design process to an open ended problems
CO2	Determine suitable material and size for structural component of machine/system
CO3	Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing
CO4	Choose logically and defend selection of design factors
CO5	Design of components for given part/system i.e shaft, keys, coupling, links, screws, springs etc.
CO6	Work effectively as a part of design group/team
CO7	Have good communication skill, orally, graphically as well as in writing

BTMEL609 IC Engine Lab

Course Outcomes:

CO1	Conduct test on IC Engines to study their performance.
CO2	Draw performance curves of these machines/systems.
CO3	Analyse the results obtained from the tests.
CO4	Draw conclusions based on the results of the experiments

BTMEL610 Refrigeration and Air Conditioning Lab

Course Outcomes:

CO1	Conduct test on Refrigeration and air conditioning test units to study their performance.
CO2	Draw performance curves of these machines/systems.
CO3	Analyse the results obtained from the tests.
CO4	Draw conclusions based on the results of the experiments

BTMEM611 Technical Project for Community Services

Course Outcomes: :

CO1	Visit nearby places to understand the problems of the community
CO2	Select one of the problems for the study, state the exact title of the project and define scope of the problem
CO3	Explain the motivation, objectives and scope of the project
CO4	Evaluate possible solutions of the problem
CO5	Design, produce, test and analyze the performance of product/system/process
CO6	Modify, improve the product/system/process