Subject Code	Subject Name	CO Number	Course outcome Statement
BTBS101	Engineering Mathematics – I	CO101.1	Apply the matrix technique (Linear algebra) to find solutions of system of linear equations arising in many engineering problem
		CO101.2	Demonstrate the concept of partial derivatives and their applications to Maxima/ Minima, series expansion of multi valued functions & Compute Jacobian of functions of several variables.
		CO101.3	Identify and sketch of curves in various coordinate system & Evaluate multiple integrals and their applications to area and volume
BTBS102	Engineering Chemistry	CO1202.1	Develop the importance of water in industrial and domestic usage.
		CO1202.2	Interpret the knowledge of phases, components, degree of freedom and apply it in various phase diagrams.
		CO1202.3	Describe various methods of metallurgy, types of fuels and lubricants, and also able to define various concepts of electrochemistry.
BTES103	Engineering Mechanics	CO103.1	Know and apply fundamental Laws of Engineering Mechanics
		CO103.2	Know and apply conditions of static equilibrium to analyze given force system
		CO103.3	Compute Centre of gravity and Moment of Inertia of plane surfaces
		CO103.4	Compute the motion characteristics of a body /particle for a Rectilinear and Curvilinear motion.
		CO103.5	Know and discuss relation between force and motion characteristics
BTES104	Computer Programming in C	CO103.1	To illustrates the Process of programming, Fundamental Basic and various operators in c
		CO103.2	To illustrate and implement various decision statement ,loops and Function in c
		CO103.3	To Explain and implement Derived Data type -Array, String and User defined Data type –Structure
BTES105L	Workshop Practices	COWS1205.1	Perform carpentry operations like planning, cutting, fitting of joints using hand and power tools
		COWS1205.2	Perform fitting operations such as marking, cutting, filling, drilling and tapping using hand and power tools and also basic plumbing Operations.
		COWS1205.3	Perform sheet metal operations such as marking, shearing, bending, punching, and soldering using hand and power tools and Welding operations like joint preparations, electrode selections.
		COWS1205.4	Understand the simple machining skills on lathe machine operations and its use during their project work
BTES106	Basic Electrical and Electronic Engineering	CO106.1	Apply basic ideas and principles of electrical engineering
		CO106.2	Identify protection equipment and energy storage devices
		CO106.3	Differentiate electrical and electronics domains and explain the operation of diodes and transistors.
		CO106.4	Acquire knowledge of digital electronics
		CO106.5	Design simple combinational and sequential logic circuits.
BTBS108L	Engineering Chemistry Lab	CO1202L.1	Test the quality of water sample by determination of hardness, acidity, alkalinity and dissolve oxygen present in it.
		CO1202L.2	Examine chemical or physical property of given sample material.
		CO1202L.2	Determine the concentration of specific ions present in the solution using titration methods.
BTES109L	Engineering Mechanics Lab	CO108L.1	Calculate beam reaction by Parallel Force apparatus and graphics static method and forces in truss.
		CO108L.2	Evaluate co-efficient of friction and centroid of irregular shaped bodies.
		CO108L.3	Evaluate mechanical advantage, Velocity ratio, efficiency and mass moment of inertia.
BTBS201	Engineering Mathematics – II	CO201.1	Discuss the need and use of complex variables to find roots, to separate complex quantities and to establish relation between circular and hyperbolic functions.
		CO201.2	Solve first and higher order differential equations and apply them as a mathematical modeling in electric and mechanical systems.
		CO201.3	Determine Fourier series representation of periodic functions over different intervals.
		CO201.4	Demonstrate the concept of vector differentiation and interpret the physical and geometrical meaning of gradient, divergence &curl in various engineering streams. Apply the principles of vector integration to transform line integral to surface integral, surface to volume integral &vice versa using Green's , stokes and Gauss divergence theorems
BTBS202	Engineering Physics	CO102.1	Apply the concept of types of oscillations in engineering.
		CO102.2	Apply the fundamentals of interference, polarization in LASER, and optical fiber in engineering.
		CO102.3	Determine the application of the trajectory of charge particles in the electromagnetic field, with basic principles of quantum physics.
		CO102.4	Determine the different types of crystal structures using the X-ray diffraction technique, and study the fundamentals of material science and its application in Magnetic material, Superconductors, and semiconductors.
BTES203	Engineering Graphics	CO103.1	Use of drawing instruments effectively for drawing and dimensioning
		CO103.2	Explain conventions and methods of engineering drawing
		CO103.3	Apply concepts of projections of points, lines, planes, solids and section of solids
		CO103.4	Construct isometric and orthographic views of given objects
BTHM204	Communication Skills	CO104.1	Apply Verbal and Non-Verbal communication in professional and social situations
		CO104.2	Apply communication skills for presentations, group discussion, interpersonal interactions, public speaking, report writing and business correspondence
		CO104.3	Apply phonetics and grammar in communication to develop a neutral accent
BTES205	Energy and Environmental Engineering	CO205.1	Identify conventional, non-conventional energy sources.
		CO205.2	Know and discuss power consuming and power developing devices for effective utilization and power consumption
		CO205.3	Identify various sources of air, water pollution and its effects.

H.O.D. Mechanical Dept.
SVKM's Institute of Technology, Dhule

Course Code	Course Name	CO Code	Course Outcome
		CO205.4	Know and discuss noise, soil, thermal pollution and Identify solid, biomedical and hazardous waste.
BTES206	Basic Civil and Mechanical Engineering	CO206.1	Identify various Civil Engineering materials and choose suitable material among various options.
		CO206.2	Apply principles of surveying to solve engineering problem.
		CO206.3	Identify various Civil Engineering structural components and select appropriate structural system among various options.
		CO206.4	Explain and define various properties of basic thermodynamics, materials and manufacturing processes.
		CO206.5	Know and discuss the working principle of various power consuming and power developing devices.
BTBS207 L	Engineering Physics Lab	CO1202L.1	Determine the mechanical & electrical properties of matter.
		CO1202L.2	Determine the wavelength of He-Ne Laser and numerical aperture of optical fibre.
		CO1202L.3	Determine the various properties of semiconducting materials
BTES208 L	Engineering Graphics Lab	CO1203L.1	Use of drawing instruments effectively for drawing and dimensioning
		CO1203L.2	Implement various fundamental geometrical constructions
		CO1203L.3	Apply concepts of projections of points, lines, planes, solids and section of solids
		CO1203L.4	Construct isometric and orthographic views of given objects
BTHM209L	Communication Skills Lab	CO209L.1	To illustrate the process of introduction with RP exercising Transcription, Stress and Intonations
		CO209L.2	To apply Verbal and Non-Verbal communication through Extempore, GD, Debate, Presentation and Interviews.
BTBSC 301	Engineering Mathematics III	C301.1	Find Laplace transform of functions using various formulas and properties. Evaluate particular types of integration.
		C301.2	Find Inverse Laplace transform of functions using various formulas and properties. Solve linear differential/simultaneous linear differential equation using Laplace and inverse Laplace transform.
		C301.3	Find Fourier and inverse Fourier transform, Fourier sine and inverse Fourier sine transform. Cosine transform and inverse Fourier cosine Transform of functions.
		C301.4	Form PDE by eliminating arbitrary constant, solve PDE and use PDE to solve one and two dimensional heat flow equation.
		C301.5	Determine Analytic functions//Bilinear transformation/ apply Cauchy's theorem/Cauchy's integral formula and Residue theorem to solve contour integration.
BTMEC 302	Material Science and Metallurgy	C302.1	Explain various crystal structures of materials
		C302.2	Explain mechanical properties of materials and calculate same using appropriate equations
		C302.3	Explain phase diagrams of various engineering materials
		C302.4	Explain heat treatment process for a given application
		C302.5	Explain sample preparation of different materials for metallography
		C302.6	Explain NDT technique for a given application
BTMEC 303	Fluid Mechanics	CO303.1	Define fluid, define, and calculate various properties of fluid
		CO303.2	Calculate hydrostatic forces on the plane and curved surfaces and explain stability of floating bodies
		CO303.3	Explain various types of flow. Calculate acceleration of fluid particles
		CO303.4	Apply Bernoulli's equation and Navier-Stokes equation to simple problems in fluid mechanics
		CO303.5	Explain laminar and turbulent flows on flat plates and through pipes
		CO303.6	Explain and use dimensional analysis to simple problems in fluid mechanics
		CO303.7	Understand centrifugal pump
BTMEC 304	Machine Drawing and CAD	C304.1	Interpret the object with the help of given sectional and orthographic views
		C304.2	I am able to Construct the curve of intersection of two solids
		C304.3	Draw machine element using keys, cotter, knuckle, bolted and welded joint
		C304.4	Assemble details of any given part, i.e., valve, pump, machine tool part etc.
		C304.5	represent tolerances and level of surface finish on production drawings
		C304.6	Understand various creating and editing commands in Auto-CAD
BTMEC 305	Thermodynamics	C305.1	Define the terms like system, boundary, properties, equilibrium, work, heat, ideal gas, entropy etc. used in thermodynamics.
		C305.2	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.
		C305.3	Study various types of processes like isothermal, adiabatic, etc. considering system with ideal gas and represent them on p-v and T-s planes.
		C305.4	Apply availability concept to non-flow and steady flow type systems
		C305.5	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
		C305.6	Define the concept of entropy and explain its physical interpretation with examples. Sketch entropy as an ordinate against various properties as an abscissa. Derive various equations related to entropy and explain the laws related to entropy.
BTHM 3401	Basic Human Rights	CO3401.1	Understand the history of human rights
		CO3401.2	Learn to respect others caste, religion, region and culture
		CO3401.3	Be aware of their rights as Indian citizen
		CO3401.4	Understand the importance of groups and communities in the society
		CO3401.5	Realize the philosophical and cultural basis and historical perspectives of human rights
		CO3401.6	Make them aware of their responsibilities towards the nation
BTMEL 307	Material Science and Metallurgy Lab	L307.1	Select and perform appropriate hardness test and formability test for a given material
		L307.2	Select the appropriate non-destructive test and perform it
		L307.3	Plot hardenability curve of a materials hardenability using Jominy End-Quench Test
		L307.4	Explain the microstructure of various ferrous and non-ferrous materials using optical microscopy
BTMEL 308	Fluid Mechanics Lab	L308.1	Identify laminar and Turbulent flow and determine Critical Reynolds number using Reynolds Apparatus.
		L308.2	Verify Bernoulli's theorem
		L308.3	Determine pressure drop in flow though pipes and pipe fittings
		L308.4	Determine viscosity using viscometer

H.O.D. Mechanical Dept.
SVKM's Institute of Technology, Dhule

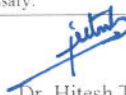|		L308.5	Determine metacentric height of floating body
BTMEL 309	Machine Design and CAD Lab	C309.1	I am able to Draw Conventional representation of standard machine components, welds, materials etc.
		C309.2	I am able to Draw sectional view of a given machine component
		C309.3	Develop Assemble view from details of given component i.e., valve, pump, machine tool part, etc.
		C309.4	Combine details of given machine component and draw assembled view
		C309.5	Use various Auto-CAD commands to draw orthographic projection
		C309.6	Draw sectional view from pictorial view of given machine component using Auto-CAD
BTMEF 310	Internship	C310.1	To make the students aware of industrial culture and organizational setup
		C310.2	To create awareness about technical report writing among the student.
BTMEC 401	Manufacturing Process I	CO401.1	Identify castings processes, working principles and applications and list various defects in metal casting
		CO401.2	Understand the various metal-forming processes, working principles and applications
		CO401.3	Study processes such as welding, brazing, soldering, shaping, planning, drilling, and their types and related tooling.
		CO401.4	Study center lathe and milling machine with operations, which includes plain turning, taper turning, and work holding devices, cutting tools, milling cutters and indexing for gear cutting.
BTMEC 402	Theory of Machines I	CO402.1	Define basic terminology of kinematics of mechanisms
		CO402.2	Classify planar mechanisms and calculate its degree of freedom
		CO402.3	Perform kinematic analysis of a given mechanism using ICR and RV methods
		CO402.4	Perform kinematic analysis of a given mechanism analytically using vector or complex algebra method
		CO402.5	Perform kinematic analysis of slider crank mechanism using Klein's construction and analytical approach
		CO402.6	Understand the concepts of friction and extend the concepts to calculate braking torque and frictional torque in different types of brakes and clutches respectively.
		CO402.7	Draw different types of cams and followers and find the position and magnitude of the balancing masses required in reciprocating and rotary engines.
BTMEC 403	Strength of Materials	C403.1	State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E, µ, etc.
		C403.2	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
		C403.3	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
		C403.4	Analyze given beam for calculations of SF and BM
		C403.5	Calculate slope and deflection at a point on cantilever /simply supported beam using double integration, Macaulay's, Area-moment and superposition methods
		C403.6	Differentiate between beam and column and calculate critical load for a column using Euler's and Rankine's formulae
BTMEC404	Numerical Methods in Engineering	COMEC404.1	Describe the concept of error
		COMEC404.2	Illustrate the concept of various Numerical Techniques
		COMEC404.3	Evaluate the given Engineering problem using the suitable Numerical Technique
		COMEC404.4	Develop the computer programming based on the Numerical Techniques
BTID405	Product Design Engineering -I	COBTID405.1	Create simple mechanical designs
		COBTID405.2	Create design documents for knowledge sharing
		COBTID405.3	Manage own work to meet design requirements
		COBTID405.4	Work effectively with colleagues
BTHM3402	Elective II: Interpersonal Comm Skills & Self Devp for Engineers	CO3402.1	Acquire interpersonal communication skills.
		CO3402.2	Develop the ability to work independently
		CO3402.3	Develop the qualities like self-discipline, self-criticism and self-management.
		CO3402.4	Have the qualities of time management and discipline.
		CO3402.5	Present themselves as inspiration for others.
		CO3402.6	Develop themselves as good team leaders.
BTMEL 407	Manufacturing Process Lab I	CO407.1	Perform plain turning, step turning, knurling, eccentric turning, chamfering and facing operations on lathe
		CO407.2	Prepare setup and fabricate composite job using milling, shaping and drilling machine.
		CO407.3	Making spur gears on a milling machine.
		CO407.4	Prepare sand casting setup using split pattern for simple component.
		CO407.5	Perform joining of two plate using TIG/MIG welding.
		CO407.6	Demonstrate cutting of a sheet metal using flame cutting.
BTMEL408	Theory of Machines Lab I	C408.1	Perform graphically kinematic analysis of any planar mechanism using ICR and RV methods.
		C408.2	Perform graphically kinematic analysis of slider crank mechanism using Klein's construction.
		C408.3	Demonstrate use of graphical differentiation method for kinematic analysis of slider crank mechanism or any other planar mechanism with a slider.
		C408.4	Sketch polar diagram for a Hooke's joint.
		C408.5	Perform experimental analysis of slider crank mechanism to calculate velocity and acceleration
		C408.5	Develop a computer program for calculation of velocity and acceleration of slider crank mechanism
BTMEL 409	Strength of Materials Lab	C409.1	Analyze the stress-strain behavior of materials using different methods
		C409.2	Measure torsional strength and impact resistance of the material
BTMEL 410	Numerical Methods Lab	BTMEL410.1	Understand the basic concepts and applications of programming languages and selecting any one for developing the programmes to solve problems based on the numerical methods
		BTMEL410.2	Understand the basic working principals of the selected programming languages
		BTMEL410.3	Develop the computer programming based on the Numerical Techniques
		BTMEL410.4	Perform the execution and debugging of computer programs
BTMEC	Heat Transfer	CO501.1	Explain the laws of heat transfer and deduce the general heat conduction equation and to explain it for 1-D steady state heat

501			transfer in regular shape bodies.
		CO501.2	Describe the critical radius of insulation, overall heat transfer coefficient, thermal conductivity and lumped heat transfer.
		CO501.3	Interpret the extended surfaces
		CO501.4	Illustrate the boundary layer concept, dimensional analysis, forced and free convection under different conditions.
		CO501.5	Describe the Boiling heat transfer, mass transfer and Evaluate the heat exchanger and examine the LMTD and NTU methods applied to engineering problems.
		CO501.6	Explain the thermal radiation black body, emissivity and reflectivity and evaluation of view factor and radiation shields.
BTMEC 502	Applied Thermodynamics I	C502.1	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.
		C502.2	Study and Analyze gas power cycles and vapour power cycles like Joule cycle and Rankine cycle and derive expressions for the performance parameters like thermal efficiency, Pm.
		C502.3	Classify various types of boiler, nozzle, steam turbine and condenser used in steam power plant.
		C502.4	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.
BTMEC 503	Machine Design I	C503.1	Formulate the problem by identifying customer need and convert into design specification
		C503.2	Understand component behavior subjected to loads and identify failure criteria
		C503.3	Analyze the stresses and strain induced in the component
		C503.4	Design of machine component using theories of failures
		C503.5	Design of component for finite life and infinite life when subjected to fluctuating load
		C503.6	Design of components like shaft, key, coupling, screw and spring
BTMEC 504	Theory of Machines II	C504.1	Explain various types of gear boxes, gear trains, belt and rope drives
		C504.2	Interpreting physical principles and phenomenon of governor, gyroscopic, flywheel
		C504.3	Measure vibration parameters in single degree of freedom systems
		C504.4	Evaluating natural frequency of 1 do
BTMEC 505	Metrology and Quality Control	C505.1	Identify techniques to minimize the errors in measurement
		C505.2	Identify methods and devices for measurement of length, angle, and gear and thread parameters, surface roughness and geometric features of parts.
		C505.3	Choose limits for plug and ring gauges.
		C505.4	Explain methods of measurement in modern machineries.
		C505.5	Select quality control techniques and its applications.
		C505.6	Plot quality control charts and suggest measures to improve the quality of product and reduce cost using Statistical tools.
BTID 506	Product Design Engineering II	COBTID406.1	Create prototypes
		COBTID406.2	Test the prototypes
		COBTID406.3	Understand the product life cycle management
BTMEC 506	Elective II (Automobile Engg)	CO506A.1	Identify the different parts of the automobile
		CO506A.2	Explain the working of various parts like engine, transmission, clutch, brakes etc.
		CO506A.3	Demonstrate various types of drive systems.
		CO506A.4	Apply vehicle troubleshooting and maintenance procedures.
		CO506A.5	Analyze the environmental implications of automobile emissions. And suggest suitable regulatory modifications.
		CO506A.6	Evaluate future developments in the automobile technology.
BTMEL 507	Heat Transfer Lab	CO507.1	Understand the various heat transfer mode of heat transfer and its application and verify.
		CO507.2	Learn the experimental methodology
		CO507.3	Describe the concept the terms like least count, calibration of the instruments
BTMEL 508	Applied Thermodynamics Lab	CO508L.1	Conduct test on Bomb calorimeter, nozzle, steam turbine, condenser, compressor etc. to study their performance.
		CO508L.2	Draw performance curves of these machines.
		CO508L.3	Analyze the results obtained from the tests.
		CO508L.4	Draw conclusions based on the results of the experiments
		CO508L.5	Based on your visit to Industry, sketch its layout and write specifications.
BTMEL 509	Machine Design Practice I	C509.1	Apply design process to an open ended problem
		C509.2	Determine suitable material and size for structural component of machine/system
		C509.3	Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing
		C509.4	Choose logically and defend selection of design factors
		C509.5	Design of components for given part/system i.e. shaft, keys, coupling, links, screws, springs etc.
		C509.6	Work effectively as a part of design group/team
		C509.7	Have good communication skill, orally, graphically as well as in writing
BTMEL 510	Theory of Machines II Lab	L510.1	Explain various types of gear boxes, gear trains, belt and rope drives
		L510.2	Interpreting physical principles and phenomenon of governor, gyroscopic, flywheel
		L510.3	Measure vibration parameters in single degree of freedom systems
		L510.4	Evaluating natural frequency of 1 dof
BTMEF511	Internship	C511.1	To make the students aware of industrial culture and organizational setup
		C511.2	To create awareness about technical report writing among the student.
BTMEC 601	Manufacturing Processes II	C601.1	Comprehend the process of powder metallurgy and its applications
		C601.2	Calculate the cutting forces in orthogonal and oblique cutting
		C601.3	Evaluate the machinability of materials
		C601.4	Comprehend the abrasive processes
		C601.7	Understand the manufacturing process of Ceramics, Glasses and their design considerations

H.O.D. Mechanical Dept.
SVKM's Institute of Technology, Dhule

		C601.8	Explain different molding techniques for processing of plastics
BTMEC 602	Machine Design II	C602.1	Define function of bearing and classify bearings.
		C602.2	Understanding failure of bearing and their influence on its selection.
		C602.3	Classify the friction clutches and brakes and decide the torque capacity and friction disk parameter.
		C602.4	Select materials and configuration for machine element like gears, belts and chain
		C602.5	Design of elements like gears, belts and chain for given power rating
		C602.6	Design thickness of pressure vessel using thick and thin criteria
BTMEC 603	Applied Thermodynamics II	C603.1	Explain the working of I.C. engine with basic components and Apply principles of thermodynamics for analysis of Air Standard Cycles.
		C603.2	Explain the various engine systems, emissions of I.C. engine, alternative fuels and analyze the engine performance considering various parameters.
		C603.3	Explain fundamentals of various refrigeration systems and analyze refrigeration systems performance with different parameters.
		C603.4	Explain different parameters of air conditioning processes.
		C603.5	Analyze the performance of various power cycles for different configurations.
		C603.6	Compare the different types of power plants.
BTMEC 604	Elective (IC Engine)	C604B.1	Understand the engine fundamentals and various engine components.
		C604B.2	Explain stages of combustion in SI and CI engines and factors affecting it.
		C604B.3	Understand the engine supporting systems.
		C604B.4	Evaluate Performance parameters of SI and CI engines during testing. Understand the concept of fuel cell technology and electric vehicle
		C604B.5	Describe fuel cell technology and its types
		C604B.6	Explain the concept of Electric Vehicle and Hybrid Vehicle
BTMEC 605C	Elective (RES)	C605C.1	Explain the difference between renewable and non-renewable energy.
		C605C.2	Describe working of solar collectors.
		C605C.3	Explain various applications of solar energy.
		C605C.4	Describe working of other renewable energies such as wind, biomass
BTMEC 606B	OEC4/Solar Energy (Audit)	C606.1	Calculate direct, diffuse and global solar radiations falling on horizontal and inclined surfaces.
		C606.2	Analyze the performance of flat plate collector, air heater and concentrating type collector.
		C606.3	Understand test procedures and apply these while testing different types of collectors.
		C606.4	Evaluate performance and compare various types of thermal energy storage systems.
		C606.5	Calculate payback period and annual solar savings due to replacement of conventional systems.
		C606.6	Analyze solar water heating system for a few domestic and commercial applications.
BTMEL 607	Metrology and Quality Control Lab	C607.1	Measure linear, angular circular features, dimensional and geometric features
		C607.2	Measure surface roughness of components.
		C607.3	Calibrate metrological equipment
		C607.4	Determine the process capability
		C607.5	Select quality control tools in total quality management.
BTMEL 608	Machine Design Practice II	C608.1	Apply design process to an open ended problems
		C608.2	Determine suitable material and size for structural component of machine/system.
		C608.3	Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing.
		C608.4	Choose logically and defend selection of design factors.
		C608.5	Design of components for given part/system i.e. shaft, keys, coupling, links, screws, springs etc.
		C608.6	Work effectively as a part of design group/team.
		C608.7	Have good communication skill, orally, graphically as well as in writing.
BTMEL 609	I C Engine Lab	CO609.1	Conduct test on IC Engines to study their performance.
		CO609.2	Draw performance curves of these machines/systems.
		CO609.3	Analyze the results obtained from the tests.
		CO609.4	Draw conclusions based on the results of the experiments
		CO609.5	Describe the working of carburetor and fuel injector
		CO609.6	Describe the working of ignition system.
BTMEL 610	Refrigeration and Air Conditioning Lab	L610.1	Conduct test on Refrigeration and air conditioning test units to study their performance.
		L610.2	Draw performance curves of these machines/systems.
		L610.3	Analyse the results obtained from the tests.
		L610.4	Draw conclusions based on the results of the experiments.
BTMEM 611	TPCS	C611.1	Visit nearby places to understand the problems of the community
		C611.2	Select one of the problems for the study, state the exact title of the project and define scope of the problem
		C611.3	Explain the motivation, objectives and scope of the project.
		C611.4	Evaluate possible solutions of the problem.
		C611.5	Design, produce, test and analyze the performance of product/system/process.
		C611.6	Modify, improve the product/system/process.
BTMEC 701	Mechatronics	C701.1:	Define sensor, transducer and understand the applications of different sensors and transducers.
		C701.2:	Explain the signal conditioning and data representation techniques.
		C701.3:	Design pneumatic and hydraulic circuits for a given application.
		C701.4:	Write a PLC program using Ladder logic for a given application.
		C701.5:	Understand applications of microprocessor and micro controller.

H.O.D. Mechanical Dept.
SVKM's Institute of Technology, Dhule

		C701.6	Analyse PI, PD and PID controllers for a given application.
BTMEC 702	CAD/CAM	C702.1	List and describe the various input and output devices for a CAD work station
		C702.2	Carry out/calculate the 2-D and 3-D transformation positions (Solve problems on 2-D and 3-D transformations)
		C702.3	Describe various CAD modeling techniques with their relative advantages and limitations
		C702.4	Develop NC part program for the given component, and robotic tasks
		C702.5	Describe the basic Finite Element procedure
		C702.6	Explain various components of a typical FMS system, Robotics, and CIM
		C702.7	Classify parts in part families for GT
		C702.8	Describe and differentiate the CAPP systems
BTMEC 703	Manufacturing Processes III	C703.1	Differentiate clearly between NC and CNC machines and Explain the working of CNC components
		C703.2	Prepare and execute a part program for producing a given product.
		C703.3	Explain appropriate non-traditional machining processes
		C703.4	Explain different surface coating techniques.
		C703.5	Explain different rapid prototyping techniques.
		C703.6	Explain the working principle of various micro-manufacturing processes.
BTMEC 704B	Industrial Engineering and Management	CO704B.1	Understand and apply the planning and organizing function of management in an organization
		CO704B.2	Understand and apply the staffing, leading and controlling function of management in an organization.
		CO704B.3	Understand the types of manufacturing, service systems and apply the concepts of forecasting, material requirement planning and operations scheduling in production/operations management.
		CO704B.4	Apply concepts of product design, capacity planning, plant location, plant layout and assembly line balancing in the design of operational systems for enhancing productivity in an organization.
		CO704B.5	Understand and analyze different concepts of industrial engineering like work study, method study and work measurement.
		CO704B.6	Apply basic principles of ergonomics, concurrent engineering and TQM in the design of work system.
BTMEC 705A	Engineering Economics	C705.1	Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, Benefit-cost ratio.
		C705.2	Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.
		C705.3	Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
		C705.4	Compute the depreciation of an asset using standard Depreciation techniques to assess its impact on present or future value
		C705.5	Apply all mathematical approach models covered in solving engineering economics problems: mathematical formulas, interest factors from tables, Excel functions and graphs. Estimate reasonableness of the results.
		C705.6	Examine and evaluate probabilistic risk assessment methods.
		C705.7	Compare the differences in economic analysis between the private and public sectors. Recognize the limits of mathematical models for factors hard to quantify.
		C705.8	Develop and demonstrate teamwork, project management, and professional communications skills
BTMEL 706	Manufacturing Processes Lab III	C703.1	Analyze the types of chips generated during various machining processes.
		C703.2	Explain the effect of process parameter during turning process.
		C703.3	Develop manual part program for performing various CNC operations
		C703.4	Describe the concept of wire EDM technology and its applications.
BTMEL 707	Mechatronics Lab	C707.1	Understand the various types of sensors and their applications.
		C707.2	Design a pneumatic circuit for a given application
		C707.3	Design a hydraulic circuit for a given application
		C707.4	Write a PLC program using Ladder logic
		C707.5	Experiment PID controller for controlling temperature
		C707.6	Demonstrate the capacitance sensor for measuring level
BTMEL 708	CAD/CAM Lab	C708.1	Construct CAD part models, assembly model and drafting of machine elements using CAD software
		C708.2	Evaluate stresses in components subjected to simple structural loading using FE software
		C708.3	Write NC programs for turning and milling
		C708.4	Describe case study of industrial robots
BTMES 709	Seminar	C709.1	State the exact title of the seminar
		C709.2	Explain the motivation for selecting the seminar topic and its scope
		C709.3	Search pertinent literature and information on the topic
		C709.4	Critically review the literature and information collected
		C709.5	Demonstrate effective written and verbal communication
BTMEF 710	Internship	C710.1	To make the students aware of industrial culture and organizational setup
		C710.2	To create awareness about technical report writing among the student.
BTMEP 711	Project Stage I	C711.1	State the exact title of the project and problem definition
		C711.2	Explain the motivation, objectives and scope of the project
		C711.3	Review the literature related to the selected topic of the project
		C711.4	Design the mechanism, components of the system and prepare detailed drawings
		C711.5	Evaluate the cost considering different materials/manufacturing processes
BTMEC 801A	Fundamentals of Automotive Systems	C801A.1	Explain various types of I.C. Engines and Cycles of operation.
		C801A.2	Recognize normal and abnormal combustion in SI and CI engines, also examine engine performance.
		C801A.3	Explain the effects of emission formation of IC engines, its effects and the legislation standards
		C801A.4	Explain the working of various parts like clutch, transmission, powertrain etc.
		C801A.5	Classify and explain brakes and steering systems
		C801A.6	Explain Suspension system, wheel alignment and Tyres.

H.O.D. Mechanical Dept.
SVKM's Institute of Technology, Dhule

		CO801F.1	Understand the renewable, non-renewable energy sources, impact of current energy usage and sector wise consumption.
BTMEC 801F	Non-Conventional Energy Sources	CO801F.2	Explain the concept of solar energy budget, solar spectrum and types of solar collectors.
		CO801F.3	Explain the characteristics, functioning of p-n Junction, manufacturing of p-n junction, interaction of p-n junction with radiation, functioning of p-n junction solar cell and determination of operational characteristics of p-n junction based solar cell and its construction.
		CO801F.4	Explain the principle of photo catalysis, OTEC, geothermal energy, biomass, overview of wind mill, types of wind mill, and design of wind turbine and examine the performance characteristics and performance limits of wind mill
		CO801F.5	Describe the various parts of battery with function, battery technology, battery test process, significance of C-Rate and its effect on charge discharge curve, different battery structures and their types.
		CO801F.6	Explain the types of fuel cells, issues associated with fuel processing, electrochemical devices, super capacitor, Flywheels and magneto hydrodynamic power generation.
BTMEP 803	Project Stage II	C803.1	State the aim and objectives for this stage of the project
		C803.2	Construct and conduct the tests on the system/product
		C803.3	Analyze the results of the tests.
		C803.4	Discuss the findings, draw conclusions, and modify the system/product, if necessary.

Dr. Hitesh Thakare
HOD, Mechanical Engineering Dept.
H.O.D. Mechanical Dept.
SVKM's Institute of Technology, Dhule