FABTECH TECHNICAL CAMPUS
College of Engineering & Research, Sangola
An Autonomous Institute, Accredited by NAAC "A" Grade
Approved by AICTE, New Delhi, DTE, (M.S.), Mumbai & Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Dist- Raigad. DTE CODE-6756

A.Y.:2024-2025

For Graduation Courses

B. Tech in Mechanical Engineering

Program Educational Objectives (PEOs)

PEO1	Taking pride in their profession and have commitment to highest standards of ethical practices andrelated technical disciplines;
PEO2	Able to design various structures and systems that is safe, economical and efficient;
PEO3	Capable of using modern tools efficiently in all aspects of professional practices
PEO4	Dealing successfully with real life civil engineering problems and achieve practical solutions basedon a sound science and engineering knowledge;
PEO5	Shall be engage in continuous research, development and exchange of knowledge for professionaldevelopment;

Program Outcomes (POs)

PO1	Apply the knowledge of mathematics, basic sciences, and mechanical engineering to the solution of complex engineering problems.
PO2	Identify, formulate, research literature, and analyze complex mechanical engineering problems reaching substantiated conclusions.
PO3	Design solutions for complex engineering problems and design mechanical system components that meet the specified needs.

PO4	Use mechanical engineering research-based knowledge related to interpretation of data and provides valid conclusions.
PO5	Create, select, and apply modern mechanical engineering and IT tools to complex engineering activities with an understanding of the limitations.
PO6	Apply reasoning acquired by the mechanical engineering knowledge to assess societal and safety issues.
PO7	Understand the impact of engineering solutions on the environment, and demonstrate the knowledge for sustainable development.
PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communicate effectively on complex engineering activities with the engineering community and with society at large.
PO11	Understand the engineering and management principles and apply these to the multidisciplinary environments.
PO12	Recognize the need for life-long learning in the broadest context of technological change.

Program-Specific Outcomes (PSOs)

PSO1	Make the students employable in engineering industries.
PSO2	Motivate the students for higher studies and research.
PSO3	Motivate the students for various competitive examinations

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B. Tech in Mechanical Engineering

Course Outcomes (COs)

SEMETER-III **CLASS: S.Y.**

Sr. No.	Subject Name	Course Outcomes
1)	**Engineering Mathematics-III (BTBS301)**	• Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits. • Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing. • Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing. • Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields. • Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

2	**Fluid Mechanics (BTMC302)**	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 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 centrifugal pump.
3	**Thermodynamics (BTMC303)**	CO1 Define the terms like system, boundary, properties, equilibrium, work, heat, ideal gas, entropy etc. used in thermodynamics. CO2 Studied different laws of thermodynamics and apply these to simple thermal systems to study energy balance. CO3 Studied Entropy, application and disorder. CO4 Studied various types of processes like isothermal, adiabatic, etc. considering system with ideal gas and represent them on p-v and T-s planes. 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.
4.	**Material Science and Metallurgy(BTMES304)**	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
5.	**Machine Drawing and CAD Lab (BTMCL305)**	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

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SEMETER-IV **CLASS: S.Y.**

Sr. No.	Subject Name	Course Outcomes
1.	**Manufacturing Processes-I (BTMC401)**	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, planning and drilling, their types and related tooling's
2.	**Theory of Machines- I (BTMC402)**	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 Introduction of different types of lubrication system. CO5 Perform kinematic analysis of slider crank mechanism using Klein's construction and

		analytical approach CO6 Perform balancing of unbalance forces in rotating masses, different types of single/multi cylinder reciprocating engines in different positions.
3.	**Basic Human Rights (BTHM403)**	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
4.	**Strength of Materials (BTMES404)**	CO1 State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E, μ, principle stresses, etc. CO2 Analyze the stresses and strain energy in different load cases CO3 Design the columns based on deflection CO4 Design a beam based on bending and shafts based on torsion CO5 Analyze given beam for calculations of SF and BM CO6 Calculate slope and deflection at a point on cantilever /simply supported beam using double integration, Macaulay's , Area-moment and superposition methods
5	**Sheet Metal**	CO1 Recognize common manufacturing processes of Sheet

	Engineering **(BTMPE405B)**	Metal Fabrication CO2 Understand the principles of design and fabricate of sheet metal products and recognize common material used in the industry CO3 Distinguish Shearing, Drawing and Pressing etc. processes. CO4 Know types of dies and formability. CO5 Select mechanical or hydraulic presses for the given process

SEMETER-V **CLASS: T.Y.**

Sr. No.	**Subject Name**	**Course Outcomes**
1.	**Heat Transfer** **(BTMC 501)**	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, 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
2.	**Machine Design – I** **(BTMC 502)**	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
3.	**(Theory of Machines – II)** **BTMC 503**	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, aero planes, and road vehicles. CO6 Understand free and forced vibrations of single degree freedom systems
4.	**Automobile Engineering (BTAPE504D)**	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; front and rear wheels, two and four wheel drive CO4 Apply vehicle troubleshooting and maintenance procedures.)5 Analyze the environmental implications of automobile emissions. And suggest suitable regulatory modifications.
5.	**Renewable Energy Sources(BTMOE505B)**	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 , nuclear
6.	**Applied Thermodynamics(BTMC506)**	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 Studied and Analyze gas power cycles and

		vapour power cycles and derive expressions for the performance parameters like thermal efficiency. CO3 Classify various types of boilers, nozzle, steam turbine and condenser used in steam power plant. CO4 Classify various types' condenser, nozzle and derived equations for its efficiency. 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.
7.	**Mechanical Engineering Lab – III (BTMCL 507)**	CO1 Understand the various heat transfer mode of heat transfer and its application and verify CO2 Learn the experimental methodology CO3 Explain various types of gear boxes, gear trains, belt and rope drives CO4 Interpreting physical principles and phenomenon of governor, gyroscopic, flywheel CO5 Apply design process to an open ended problem CO6 Determine suitable material and size for structural component of machine/system
8.	**IT – 2 Evaluation(BTMI408)**	CO1 To make the students aware of industrial culture and organizational setup

		CO2 To create awareness about technical report writing among the student.

SEMETER-VI **CLASS: T.Y.**

1.	**Manufacturing Processes - II (BTMC 601)**	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	Understanding plastic
2.	**Machine Design – II (BTMC602)**	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.
		CO5	Design of elements like gears, belts for given power rating

3.	**IC Engines (BTMPE603A)**	CO1	Understand various types of I.C. Engines and Cycles of operation.
		CO2	Analyze the effect of various operating variables on engine performance
		CO3	Identify fuel metering and fuel supply systems for different types of engines
		CO4	Understand normal and abnormal combustion phenomena in SI and CI engines
		CO5	Evaluate performance Analysis of IC Engine and Justify the suitability of IC Engine for different application
		CO6	Understand the conventional and non-conventional fuels for IC engines and effects of emission formation of IC engines, its effects and the legislation standards
4.	**Robotics (BTMPE604D)**	CO1	List the various components of a typical Robot, grippers, sensors, drive system and describe their functions
		CO2	Calculate the word to joint and joint to word coordinates using forward and reverse transformations
		CO3	Calculate the gripper forces, drive sizes, etc.
		CO4	Develop simple robot program for tasks such as pick and place, arc welding, etc. using some robotic language such as VAL-II, AL,

		AML, RAIL, RPL, VAL CO5 Evaluate the application of robots in applications such as Material Handling, process operations and Assembly and inspection CO6 Discuss the implementation issues and social aspects of robotics
5.	**Energy Conservation and Management(BTMOE605C)**	CO1 Understand energy problem and need of energy management CO2 Carry out energy audit of simple units CO3 Study various financial appraisal methods CO4 Analyze cogeneration and waste heat recovery systems CO5 Do simple calculations regarding thermal insulation and electrical energy conservation
6.	**Mechanical Engineering Lab – IV**	CO1 Apply design process to an open ended problems CO2 Determine suitable material and size for structural component of machine/system CO3 Conduct test on IC Engines to study their performance. CO4 Draw performance curves of these machines/systems
7.	**B. Tech Seminar(BTMS607)**	CO1 To expose and make students aware with latest research and research publications CO2 To understand the research and research publication, references, citation

		CO3 To enhance the presentation skill CO4 To enhance the report writing CO5 To make the student aware about research publication sites
8.	**Mini Project** **(BTAP608)**	CO1Visit 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

SEMETER-VII **CLASS: B.TECH**

Sr. No.	Subject Name	Course Outcomes
1)	**Mechatronics (BTMC701)**	CO1 Define sensor, transducer and understand the applications of different sensors and transducers CO2 Explain the signal conditioning and data representation techniques CO3 Design pneumatic and hydraulic circuits for a given application CO4 Write a PLC program using Ladder logic for a given application

		CO5	Understand applications of microprocessor and micro controller
		CO6	Analyse PI, PD and PID controllers for a given application
2)	**Industrial Engineering and Management (BTHM702)**	CO1	Impart fundamental knowledge and skill sets required in the Industrial Management and Engineering profession, which include the ability to apply basic knowledge ofmathematics, probability and statistics, and the domain knowledge of IndustrialManagement and Engineering
		CO2	Produce ability to adopt a system approach to design, develop, implement and innovate.
		C03	Understand the interactions between engineering, businesses, technological and environmental spheres in the modern society.
		CO4	Understand their role as engineers and their impact to society at the national and global context.
3)	**Advanced IC Engines (BTMPE703D)**	CO1	Define and Distinguish between Spark ignition and Compression ignition system. Describe Air- fuel supply systems in ic engines.
		CO2	Identify and Demonstrate normal and abnormal combustion in combustion chambers of IC engines. According to which able to analyse and Design combustion chambers.

		CO3 Recognize and discuss engine emissions formation, effects and various methods to reduce emissions and their measuring equipment's. CO4 Understand combustion and emission characteristics of an alternative energy sources and suggest appropriate applications of alternative fuels such as bio diesels, natural gas, LPG, hydrogen, etc. and their Engine modifications for using these fuels. CO5 Apply and interpret with the recent trends IC engine techniques such as HCCI, CRDI, GDI, etc. with latest measuring equipments
4)	**Entrepreneurship Development (BTMOE704B)**	CO1 enlarge the supply of entrepreneurs for rapid industrial development CO2 Develop small and medium enterprises sector which is necessary for generation of employment CO3 Industrialize rural and backward regions CO4 Provide gainful self-employment to educated young men and women CO5 Diversify the sources of entrepreneurship.
5)	**Intellectual Property Rights**	CO1 State the basic fundamental terms such as copyrights, Patents, Trademarks etc., CO2 Interpret Laws of copy-rights, Patents, Trademarks and various IP registration Processes. CO3 Exhibit the enhance capability to do economic analysis of IP rights, technology and innovation related policy issues and firms commercial

		strategies. CO4 Create awareness at all levels (research and innovation) to develop patentable technologies. CO5 Apply trade mark law, copy right law, patent law and also carry out intellectual property audits. CO6 Manage and safeguard the intellectual property and protect it against unauthorized use.

SEMETER-VIII **CLASS: B.TECH**

Sr. No.	Subject Name	Course Outcomes
1)	Project /Internship (BTMP801/ BTMI801)	CO1 State the aim and objectives for this stage of the project CO2 Construct and conduct the tests on the system/product CO3 Analyze the results of the tests. CO4 Discuss the findings, draw conclusions, and modify the system/product, if necessary
2	Fundamentals of Automotive Systems (BTMEC801A)	CO1. Acquire fundamental knowledge of the various systems of an automobile, CO2. Associate the functions of each system with its design and layout, depict the various systems using simple schematics, and apply concepts learnt in core undergraduate courses to synthesize mathematical models of the various systems.

3	**Non-Conventional Energy Resources(BTMEC801F)**	CO1.Understand Of Renewable and Non-Renewable Sources of Energy CO2. Gain Knowledge About Working Principle Of Various Solar Energy Systems CO3. Understand The Application Of Wind Energy And Wind Energy Conversion System CO4. Understand The Applications Of Different Renewable Energy Sources Like Biomass, Geothermal Energy Etc. CO5. Understand The Various Energy Storage Systems

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For Graduation Courses

First year engineering

SEMETER-I & II

Sr. No.	Subject Name	Course Outcomes
1)	24AF1000BS101 Engineering Mathematics – I	• Apply the matrix technique (Linear algebra) to find solutions of system of linear equations arising in many engineering problems.
		• Demonstrate the concept partial derivatives and their applications to Maxima/ Minima,series expansion of multi valued functions.
		• Compute Jacobian of functions of several variables and their applications to engineering problems.
		• Identify and sketch of curves in various coordinate system.
		• Evaluate multiple integrals and their applications to area and volume.
2)	24AF1CHEBS102 Engineering Chemistry	• Students should be able to understand and explain the basic concepts of Water treatment and capable to explain softening processes and water characteristics
		• Students should be able to explain analysis, Calorific value of fuel and explain lubricants, its properties and industrial importance.
		• Students should know the concepts of Electrochemistry and its importance.
		• Student should be able to understand and explain various instrumental methods of Analysis.

		• Student should be able to understand and explain properties and uses of engineering materials such as Cement, Gypsum plaster, Rubber etc.
3)	24AF1CHEBS103L Engineering Chemistry Lab	**A)** Students should be able to understand and explain the basic concepts of Water treatment and capable to explain softening processes and water characteristics
		B) Students should be able to explain analysis, Calorific value of fuel and explain lubricants, its properties and industrial importance.
		C) Students should know the concepts of Electrochemistry and its importance.
		D) Student should be able to understand and explain various instrumental methods of Analysis.
		E) Student should be able to understand and explain properties and uses of engineering materials such as Cement, Gypsum plaster, Rubber etc.
4	24AF1EMES104 Engineering Mechanics	• Apply fundamental Laws of Engineering Mechanics
		• Apply Conditions of static equilibrium to analyze given force system
		• Compute Centre of gravity and Moment of Inertia of plane surfaces
		• Compute the motion characteristics of a body/particle for a Rectilinear Motion
		• Know and discuss relation between force and motion characteristics
5)	24AF1EMES105L Engineering Mechanics Lab	• To understand the resolving forces and moments for a given force system.
		• To know and apply Conditions of static equilibrium to analyze given force system
		• To compute Centre of gravity and Moment of Inertia of

		plane surfaces.
		• To compute the motion characteristics of a body/particle for a Rectilinear Motion
		• To know and discuss relation between force and motion characteristics
6)	24AF1000ES106 Programming for Problem Solving	• Gain a broad perspective about the uses of computers in engineering industry and C Programming.
		• Understand the use of Types, operators and expressions in programming.
		• Apply the knowledge of flow statements and functions for control based computational algorithms.
		• Understand the concepts of arrays ad pointers in C.
		• Apply the knowledge of structure in OS file management.
7)	24AF1000ES107L Programming for Problem Solving Lab	**F)** Gain a broad perspective about the uses of computers in engineering industry and C Programming.
		G) Understand the use of Types, operators and expressions in programming.
		H) Apply the knowledge of flow statements and functions for control based computational algorithms.
		I) Understand the concepts of arrays ad pointers in C.
		J) Apply the knowledge of structure in OS file management.
8)	24AF1000VS108L Workshop Practices	• Prepare simple wooden joints and parts using wood working tools and machines (Apply)
		• Apply the fitting and plumbing skills and produce a job

		with specified dimensions (Apply)
		• Practice sheet metal tools and machine to develop the sheet metal articles (Apply)
		• Practice edge preparation for simple Lap, Butt, T joint using Arc/Gas/Resistance welding equipment (Understand)
		• Demonstrate machining processes including turning, facing, step turning, drilling and parting (Understand)
9)	24AF1000VS109 Communication Skills	• Students would be more confident while using English
		• Engage in analysis of speeches or discourses and several articles
		• Identify and control anxiety while delivering speech
		• Write appropriate communications(Academic/Business)
		• Prepared to take the examinations like GRE/TOFEL/IELTS
		• Identify and control the tone while speaking
		• Develop the ability to plan and deliver the well-argued presentations
10)	24AF1000VS110L Communication Skills Lab	• Students would be more confident while using English
		• Engage in analysis of speeches or discourses and several articles
		• Identify and control anxiety while delivering speech
		• Write appropriate communications(Academic/Business)

		• Prepared to take the examinations like GRE/TOFEL/IELTS
		• Identify and control the tone while speaking
		• Develop the ability to plan and deliver the well-argued presentations
11)	24AF1000CC111A Yoga Education	• Learn Message of Vedas and Upanishads.
		• Learn Four Streams of Yoga.
		• Learn Shaddarshanas or the SIX systems of IndianPhilosophy.
		• Understand Life and message of spiritual masters and IndianCulture.
		• Understand Anatomy and Physiology, Yoga and ExercisePhysiology.
	24AF1000CC111B • NSS-I	• Explain the aims, objectives, and organizational structure of the National Service Scheme.
		• Demonstrate social and civic responsibility through participation in community development activities.
		• Apply leadership, teamwork, and communication skills while organizing NSS programs.
		• Illustrate awareness of social issues related to health, environment, literacy, and sustainable development.
		• Develop empathy, ethical values, and a sense of national integration through voluntary service.
12)	24AF1000BS201	• Discuss the need and use of complex variables to find roots, separate complex quantities, and to establish relation

	Engineering Mathematics – II	between circular and hyperbolic functions.
		• Solve first and higher order differential equations and apply them as mathematicalmodeling in electric and mechanical systems.
		• Determine Fourier series representation of periodic functions over different intervals.
		• 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, Stoke's and Gauss divergence theorems.
13)	24AF2PHYBS202 Engineering Physics	• Familiar with the principles of acoustic design of a hall and also methods of production of ultrasonic and its applications in various fields and also understand the concept of dielectric and polarization types.
		• Acquire the basic knowledge of interference, polarization. Students are able to understand the light propagation in fibre and use of Laser in Science and Engineering.
		• Apply the knowledge of quantum mechanics to set Schrödinger's equations
		• Understand key principle and application of nuclear physics. Identify planes in crystal and characteristics measurements of cubic system.
		• Assimilate wide scope of advanced materials in modern developments and its role in emerging innovating applications

14)	24AF2PHYBS203L Engineering Physics Lab	• Familiar with the principles of acoustic design of a hall and also methods of production of ultrasonic and its applications in various fields and also understand the concept of dielectric and polarization types.
		• Acquire the basic knowledge of interference, polarization. Students are able to understand the light propagation in fibre and use of Laser in Science and Engineering.
		• Apply the knowledge of quantum mechanics to set Schrödinger's equations
		• Understand key principle and application of nuclear physics. Identify planes in crystal and characteristics measurements of cubic system.
		• Assimilate wide scope of advanced materials in modern developments and its role in emerging innovating applications
16)	24AF2EGRES204 Engineering Graphics	• Understand the basics of engineering graphics and its applications.
		• Describe the common terms used in design and drawing
		• Construct the positions of line for given conditions CO4 Visualize the 2D and 3D views of the object
		• Ability to apply orthographic, sectional, auxiliary and isometric view in engineering drawing
		• Understand the geometries of development of engineering projects
17)	24AF2EGRES205L	• Get acquainted with the knowledge of various lines, geometrical construction and construction of various kinds

	Engineering Graphics Lab	of scales
		• Improve their imagination skill by gaining knowledge about points, lines and planes
		• Become proficient in drawing the projections of various solids
		• Gain knowledge about orthographic and isometric projections
		• Understand different concepts of sectioning
18)	24AF1000ES206 Basic Electrical and Electronics Engineering	• Apply fundamental concepts and circuit laws to solve simple DC and AC circuits
		• Interpret the construction and working of different types of electrical machines
		• Analyze building blocks of basic dc power supply.
		• Outline the principle of BJT as an amplifier.
		• Apply the knowledge of measuring instruments in electronic instrumentation system.
19)	24AF1000ES207L Basic Electrical and Electronics Engineering Lab	• Apply fundamental concepts and circuit laws to solve simple DC and AC circuits
		• Interpret the construction and working of different types of electrical machines
		• Analyze building blocks of basic dc power supply.
		• Outline the principle of BJT as an amplifier.

		• Apply the knowledge of measuring instruments in electronic instrumentation system.
20)	24AF2CMEES208 Basic Civil and Mechanical Engineering	• Identify various Civil Engineering materials and choose suitable material among various options.
		• Apply principles of surveying to solve engineering problem
		• Identify various Civil Engineering structural components and select appropriate structural system among various options
		• Explain and define various properties of basic thermodynamics, materials and manufacturing processes.
		• Know and discuss the working principle of various power consuming and power developing devices
21)	24AF1EEEES209 Energy and Environmental Engineering	• Know and understand about components and segments of environment, ecosystem and its types.
		• Understand power consuming and power developing devices for the effective utilization
		• Understand and to explain types of Energies such as wind energy, solar energy, hydro energy etc.
		• Understand and explain various types of air pollution, their effects and control measures
		• Know the various types of water pollution, sources, waste water treatment, effect of water pollution on health and soil pollution
22)	24AF1000IK210	• This course is very important in many senses. it will

	IKS Bucket	cultivate an idea of Indian Ethics in the students.
		• It will throw some light on that traditional knowledge which is ignored but highly important for Individuals and the State.
		• It will aware to the students and others of our holistic approach to Ethics and Value from the Cosmic level to Social and Political policy as well
		• Gives various theories for the moral self-development of the individual.
23)	24AF1000VS211 Design Thinking	• Compare and classify the various learning styles and memory techniques and apply them in their engineering education.
		• Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products.
		• Develop new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products.
		• Propose real-time innovative engineering product designs and Choose appropriate frameworks, strategies, techniques during prototype development
		• Perceive individual differences and its impact on everyday decisions and further create a better customer experience.
24)	24AF1000CC212A Integrated Personality Development	• To provide students with soft skills that complement their hard skills, making them more marketable when entering the workforce.
		• To enhance awareness of India's glory and global values, and to create considerate citizens who strive for the

		betterment of their family, college, workforce, and nation.
		• To inspire students to strive for a higher sense of character by learning from role models who have lived principled, disciplined, and value-based lives.
	24AF1000CC212B NSS-II	• Explain the aims, objectives, and organizational structure of the National Service Scheme.
		• Demonstrate social and civic responsibility through participation in community development activities.
		• Apply leadership, teamwork, and communication skills while organizing NSS programs.
		• Illustrate awareness of social issues related to health, environment, literacy, and sustainable development.
		• Develop empathy, ethical values, and a sense of national integration through voluntary service.
	24AF1000CC212C Health and Wellness	• Learn how to deal with mental distress and disorders.
		• Understand and enhance positive mental health and wellbeing particularly in the field of psychology
		• Gain happiness and well-being theory and research to enrich the understanding of both negative and positive side of human behavior.

P.G.

Name of the Department- Mechanical Engineering

ProgramOutcomes(PO's)

PO 1	Acquire, demonstrate and apply advanced knowledge in the area of mechanical engineering.
PO 2	Identify problems in the field of mechanical engineering, formulate them and Solve by using advanced techniques.
PO 3	Conducting dependent research and generate new knowledge for the benefit of community, society Industry and country.
PO 4	Apply various numerical methods, advanced software and engineering tools to model, Analyze and solve mechanical engineering problems.
PO 5	Work effectively in interdisciplinary teams for solving real life problems in the related field.
PO 6	Apply engineering and scientific principles for the effective management of mechanical systems.
PO 7	Effectively communicate through Technical reports, presentations and scientific publications with the engineering community as well as society at large.
PO 8	Demonstrate traits of management in handling engineering projects, related finance, and coordinate with workforce towards achieving goals.
PO 9	Demonstrate high level of professional and intellectual integrity, ethics of research and scholarly standards.
PO 10	Examine critically the outcomes of one's actions and make Corrective measures

	subsequently.
PO 11	Demonstrate the ability to work in team in the laboratory in achieving multidisciplinary tasks required for the project.
PO 12	Engage in life-long reflective and independent learning with high level of Enthusiasm and commitment.

Program Educational Objectives (PEOs)

No.	PEO
PEO1	To train students withindepth and advanced knowledge to become professionaland capable of identifying, analyzing and solving complex problems in the areas of Heat power engineering.
PEO2	To enable post graduates to carry out innovative and independent research work,disseminate the knowledge inAcademia/Industry/Research Organizations to develop systems and processes in the related field.
PEO3	To prepare the students to exhibit a high level of professionalism, integrity,effective communication skills and environmental and social responsibility.
PEO4	To provide an academic environment that gives adequate opportunity to the students to cultivate life-long independent learning ability for their successful professional career.

FABTECH TECHNICAL CAMPUS
College of Engineering & Research, Sangola
An Autonomous Institute, Accredited by NAAC "A" Grade
Approved by AICTE, New Delhi, DTE, (M.S.), Mumbai & Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Dist- Raigad. DTE CODE-6756

P.G.

Name of the Department- Mechanical Engineering

Course Outcomes

Semester: I **(M. Tech-I)**

Sr. No.	Subject Name	Course Outcomes
1)	**Engineering Thermodynamics** **(MMECH11)**	1. Review the laws of thermodynamics 2. Explain the use of Maxwell's relations, Clapeyron equation and apply equations of state for real gases and compare. 3. Analysis of second law of thermodynamics for various processes. CO4. Analyze gas turbine cycles. 4. Illustrate the ideal gas, real gas, its deviation with compressibility chart
2)	**Machining and Forming Processes** **(MMECH12)**	1. Classify conventional and non-conventional machining processes. 2. Understand mechanism of metal cutting, introduction to tool life, cutting fluids. 3. Describe the mechanism and mechanics of grinding processes, various non-conventional machining processes. 4. Rolling, extrusion and wire drawing processes. 5. Forging in plain stain, calculations of forging loads in Closed die forging ,residual stresses in forgings, Forging defects 6. Sheet metal working processes.

3)	**Mechanical Vibrations (MMECH13)**	1. To develop in our students the ability to engage themselves to solve vibration problems. 2. To be creative problem solvers whilst dealing with machinery involving periodic phenomena 3. To integrate empirical analysis and add to the world of field expertise where possible 4. To adapt to recent advances in knowledge
4)	**Advanced Machine Design(MDE14A)**	1. To analyze variance, factorial design and regression and understand reliability theory, design and analysis of reliability. 2. Students will have the ability to analyze behavior of mechanical elements under fatigue and creep 3. To study optimization and its methods. 4. To study composite materials and its characteristics. 5. To design mechanical components for various materials and process.
5)	**Utilization of Solar Energy:** **(MTE14B)**	1. Describe measurement of direct, diffuse and global solar radiations falling on horizontal and inclined surfaces, Basic earth sun angles, Beam and diffuse radiations, Radiation on titled surfaces. 2. Analyze the performance by conducting research on flat plate collector, air heater and concentrating type collector. 3. Understand test procedures and apply these while testing different types of collectors. 4. Demonstrate and Design various types of thermal energy storage systems. 5. Analyze payback period and annual solar savings due to replacement of conventional systems 6. Demonstrate the importance of solar energy effectively to increase awareness of it in society

6	**Advanced I.C. Engines (MTE14C)**	1. Demonstrate energy management principles, identify need, organizing it. carry out energy auditing. 2. Conduct economic analysis of any industry or power plant, obtain conclusion and suggest it to industry. 3. Interpret financial appraisal methods, and thermodynamic analysis, and estimate financial budget of visited industry.
7	**Additive Manufacturing (MME14D)**	1. Understand the importance of Additive Manufacturing 2. Classify the different AM processes 3. Design for AM processes 4. Understand the applications of AM 5. Apply the AM Processes bio-medical applications
8	**Manufacturing Planning and Control (MMECH15A)**	1. Apply the systems concept for the design of production and service systems. 2. Make forecasts in the manufacturing and service sectors using selected quantitative and qualitative techniques. 3. Apply the principles and techniques for planning and control of the production and service systems to optimize/make best use of resources. 4. Understand the importance and function of inventory and to be able to apply selected techniques for its control and management under dependent and independent demand circumstances. 5. Understand the lot sizing and production scheduling. 6. Study about quality planning, cost planning and control.
9	**Hydraulic, Pneumatic and Fluidic Control (ME-XX15C)**	1. Understand the type of control system and their utility 2. Describe the hydraulic power generation 3. Design pneumatic and hydraulic circuits for a given application 4. Discuss steady state operating forces, transient forces and valve instability

		5. Design of pure fluid digital elements, Lumped and distributed parameter fluid systems
10	**Wind Energy (MTE15D)**	1. Identify and describe history of wind energy and its scope in future. 2. Survey and analyze through a literature review world distribution of wind, Weibull 25 statistic, variation in wind energy etc., 3. Conduct an experiment to use various wind energy measurement indicators, anemometers, and apply it to analyze and check data obtained from surveys. 4. Demonstrate and calculate performance parameters wind energy turbine. 5. Illustrate various electrical systems used in wind energy power plant. 6. Examine and justify economics of wind system.
11	**Finite Element Method (MME15E)**	1. Understand the basics principle of FE method 2. Identify mathematical model for solution of common problems CO3 Solve structural, thermal problem using FE in 1D Case 3. Derive element stiffness matrix by different methods 4. Understand the formulation for 2D and 3D case 5. Recognize need for and engage in lifelong learning
12	**Communication Skills (BSH16)**	1. Understand the basics principle of communication 2. Develop presentation skill techniques

13	**Mechanical Engineering Lab** **(MMECH17)**	1. Conduct test on hydraulic turbines like Pelton wheel, Francis turbine, IC Engines, Refrigeration 2. and air conditioning test units, solar system etc. to study their performance and analyze theresult. 3. Draw and analyze performance curves of these machines/systems. 4. Analyze the results obtained from the tests.

SEMETER-II **(M.TECH.-II)**

Sr. No.	Subject Name	Course Outcomes
1)	**Advanced Fluid Mechanics and Heat Transfer** **(MMECH21)**	1. Analyze steady state and transient heat conduction problems of real life Thermal systems 2. Analyze extended surface heat transfer problems and problems of phase change heat transfer like boiling and condensation 3. Apply the basic principles of classical heat transfer in real engineering application 4. Analyze the analytical and numerical solutions for heat transfer problem. 5. Understand the basic concepts of turbulence and their impact on heat transfer 6. Analyze convective heat transfer in common geometries like tube, plate, cylinder
2)	**Mechanical Design Analysis**	1. To analyze variance, factorial design and regression and understand reliability theory, design and analysis of reliability.

	(MMECH22)	2. Students will have the ability to analyze behavior of mechanical elements under fatigue and creep 3. To study optimization and its methods. 4. To study composite materials and and its characteristics. 5. To design mechanical components for various materials and process
3)	**Numerical Methods and Computational Techniques (MMECH23A)**	1. Describe the concept of error 2. Illustrate the concept of various Numerical Techniques 3. Evaluate the given Engineering problem using the suitable Numerical Technique 4. Develop the computer programming based on the Numerical Techniques
4)	**CAD-CAE** **(ME-XX23B)**	1. Demonstrate - Polynomial and spline interpolation, Bezier curves, B-splinesto surfaces representation, patches and composite surfaces. 2. Design and create Solid model assembly of thermal and fluid engineering system in CAD software. 3. Analyze simple Engineering problem by selecting appropriate Mesh generation. 4. Modeling and Meshing of Thermal and Fluid Flow equipment in CAD. 5. Simulate and demonstrate Thermal and Fluid systems by using ANSYS, EES, MATLAB etc. 6. Understand and simulate computer aided manufacturing
5)	**Computational Fluid Dynamics** **(MTE23B)**	1. Identify applications of finite volume and finite element methods to solve Navier-Stokes equations.

		2. Evaluate solution of aerodynamic flows. Appraise & compare current CFD software. Simplify flow problems and solve them exactly. 3. Design and setup flow problem properly within CFD context, performing solid using CAD package and producing grids via meshing tool. 4. Interpret both flow physics and mathematical properties of governing Navier-Stokes equations and define proper boundary conditions for solution. 5. Use CFD software to model relevant engineering flow problems. Analyse the CFD results. Compare with available data, and discuss the findings
6	**Advanced Refrigeration (MTE23C)**	1. Formulate and solve vapor compression refrigeration and multi-stage vapor compression systems. 2. Study and identify various types of refrigerants and their properties., such as zeotropic, azeotropic etc., 3. Illustrate Nomenclature, Refrigerants, alternative refrigerants, CFC/HCFC phase-out regulations, action with lubricating oil, retrofitting, refrigerant blends, effects on refrigeration components. 4. Design and analyze vapor absorption system 5. Select refrigerant control techniques, and do piping designing for refrigeration plant
7	**Design of Heat Exchangers** **(MTE23D)**	1. Demonstrate and of heat exchanger design methodology, and design considerations 2. Analyze performance of Heat exchanger by applying basic design theory. 3. Design and conduct experiment on one from double pipe, shell and tube, tube fin, plate type

		and plate-fin heat exchanger. 4. Demonstrate selection criteria of HEX and conduct an independent research to suggest suitable HEX. 5. Model and illustrate heat exchanger based on I-law and irreversibility. CO6 Study and analyze losses in HEX, and upcoming advancements.
8	**Alternative Fuels for IC Engine** **(MTE23E)**	1. Demonstrate Structure of petroleum, Refining process, Products of refining process, Select suitable fuels for use in SI engines. Understand various performances rating in SI engines. 2. Illustrate properties of petroleum products and classify them on their characteristic. 3. Describe and analyze Need for alternative fuels such as Ethanol, Methanol, LPG, CNG, Hydrogen and their manufacturing procedure. 43 4. calculate and estimate performance and emission characteristics of alternative fuels 5. Analyze environmental effects of combustion of various fuels, suggest modification in their usage.
9	**Steam and Gas Turbines (MTE24A)**	1. Illustrate properties of Steam, Draw P-V, T-s, H-s(Mollier) diagrams for steam, Describe Theoretical steam turbine cycle. 2. Demonstrate and analyze vortex flow, energy lines and reheat factors of steam turbines. Solve problems of finding performance steam turbine power plant. 3. Demonstrate simple Brayton cycle for gas turbine analyze its performance on computer simulation, suggest suitable modification and then analyze it. 4. Study and apply various Performance Improvement Techniques in steam and gas

		Turbines 5. Design and suggest and analyze cooling accessories and protective material for steam turbine. 6. Visit thermal power plant and enumerate performance and maintenance and troubleshooting criteria for steam turbine
10	**Cryogenic Engineering (MTE24B)**	1. Demonstrate and identify role of cryogenics in the industrial applications. 2. Describe mechanical, thermal, thermo-electric properties of cryogenic fluids. 3. Illustrate Ideal separation, properties of mixtures, Rectifiers column, separation of air, purification. 4. List and give details about various types of cryogenic refrigeration system, such as J-T Refrigeration systems, Philips refrigerator, Vuilleumier refrigerator, Solve refrigerator, G-M refrigerator 5. Study and describe Insulation and storage systems in cryogenic engineering
11	**Surface Engineering (MME24B)**	1. Learn the importance and need of surface engineering. 2. Describe various surface cleaning and modification techniques. 3. Understand the concepts of surface integrity. 4. Compare various surface coating technologies. 5. Select appropriate method of coating for a given application. 6. Apply measurement techniques and carry out characterization of coated surfaces.
12	**Nanotechnology**	1. Demonstrate the understanding of length scales

	(MMECH24C)	concepts, nanostructures and nanotechnology. 2. Identify and to compare various synthesis and characterization techniques involved in Nanotechnology. 3. Define and interpret the interactions at molecular scale. 4. Evaluate and analyze the mechanical properties of bulk nano-structured metals and alloys, nano-composites and carbon nanotubes. 5. Compare andanalyze the effects of using nanoparticles over conventional methods
13	**World Class Manufacturing (MME24F)**	1. Define challenges in world class manufacturing 2. Study various world class manufacturing strategies. 3. Understand total quality and employee involvement in manufacturing. 4. Discuss different world class information system for change management. 5. Identify various methods and processes for WCM using brain storming. 6. Describe method to monitor performance in WCM
14	**Research Methodology (MOE25A)**	1. Understand and Describe importance of research. 2. Classify and select appropriate resources for Research. 3. Analyze the contents of literature and identify further scope. 4. Formulate a Research Problem. 5. Develop effective written and oral Presentation skills.

15	**Design of Experiments (MOE25B)**	1. Define Taguchi, factorial experiments, variability, orthogonal array, quality loss. 2. Plan and design the experimental investigations efficiently and effectively. 3. Understand strategy in planning and conducting experiments. 4. Evaluate variability in the experimental data using ANOVA. 5. Practice statistical software to achieve robust design of experiments.
16	**Advanced Optimization Techniques** **(MOE25C)**	1. Enables to acquire mathematical methods and apply in engineering disciplines. 2. Apply methods of optimization to solve a linear,non-linear programming problem by various methods 3. Optimize engineering problem of nonlinear-programming with/without constraints, by using this technique. 4. Use of dynamic programming problem in controlling in industrial managements. 5. Simulate Thermal engineering system problem. Understand integer programming and stochastic programming to evaluate advanced optimization techniques.
17	**Environmental Engineering and Pollution Control (MOE25D)**	1. Identify effects of industrialization on environmental pollution in various field. 2. Describe photochemical smog, acid Rain, Greenhouse effect, ozone depletion, global warming. 3. Suggest pollution control techniques for vehicles, refrigeration, industries, chemical and power plant.

		4. Do Case study on any industry and analyze carbon exertion rate, water pollution, soil pollution etc. 5. Design pollution control devices for vehicle, analyze and find out replacement CFC refrigerant with HC refrigerant
18	**Seminar** **(MMECH26)**	1. Identify the topic for seminar from the recent areas and technologies in thermal and fluids engineering or related areas. 2. Carry out detailed comprehensive survey of the literature related to the topic selected. Use information available from various sources like research papers, patents, websites, discussion with experts on the topic etc. 3. Comprehend the information, organize it and write technical report. Give presentations on the topic to the group of students. 4. Identify and report latest developments and unresolved issues in the selected topic/area. 5. Analyze the impact of the technologies on the environment. Identify green technologies related to selected topic.
19	**Mini Project** **(MMECH27)**	1. Identify methods and materials to carry out experiments/develop code. 2. Reorganize the procedures with a concern for society, environment and ethics. 3. Analyze and discuss the results to draw valid conclusions. CO4 Prepare a report as per recommended format and defend the work 4. Explore the possibility of publishing papers in peer reviewed journals/conference proceedings.

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SEMETER-III **(M.TECH.-III)**

Sr. No.	Subject Name	Course Outcomes
1)	**Intellectual Property Rights (MMECH32)**	1. Enumerate and demonstrate fundamental terms such as copy-rights ,Patents ,Trademarks etc., 2. Interpret and follow Laws of copy-rights, Patents, Trademarks and various IP registration Processes to register own project research. 3. Exhibit the enhance capability to do economic analysis of IP rights, technology and innovation related policy issues and firms' commercial strategies. 4. Develop awareness at all levels (research and innovation) of society to develop patentable technologies. 5. Apply trade mark law, copy right law, patent law and also carry out intellectual property audits 6. Manage and safeguard the intellectual property and protect it against unauthorized use
2)	**Project Stage-I (MMECH33)**	1. Identify problems and to plan methodologies to solve problems. 2. Carry out exhaustive literature review, study &evaluate collected literature critically and identify the gaps based on the review. 3. Select the specific problem for the study as a project 4. Demonstrate technical writing while preparing project report and present it to evaluation committee to demonstrate presentation skills acquired

SEMETER-IV **(M.TECH-IV)**

Sr. No.	Subject Name	Course Outcomes
1)	**Project Stage-II** **(MMECH41)**	1. Solve identified technical problem using acquired knowledge and skill. 2. Use latest equipment, instruments, software tools, infrastructure and learning resources available to solve the identified project problem. Procure resources, if required. 3. Interpret theoretical/experimental findings using available tools 4. Compare the results obtained with results of similar studies 5. Draw conclusions based on the results.