List of Subjects for B.Tech. ME

Sr. No.	Course Code	PTU code	Subject Name
1	C101	BTPH101-23	Engineering Physics
2	C102*	BTPH102-23	Engineering Physics Lab
3	C103	BTAM101-23	Engineering Mathematics -I
4	C104	BTEE101-18	Basic Electrical Engineering
5	C105*	BTEE102-18	Basic Electrical Engineering Lab
6	C106	BTME101-21	Engineering Graphics & Design
7	C107	BTCH101-23	Chemistry-I
8	C108*	BTCH102-18	Chemistry-I (Lab)
9	C109	BTAM201-23	Engineering Mathematics -II
10	C110	BTPS101-18	Programming for Problem Solving
11	C111*	BTPS102-18	Programming for Problem Solving Lab
12	C112*	BTMP101-18	Workshop/Manufacturing Practices
13	C113	BTHU101-18	English
14	C114*	BTHU102-18	English Lab
15	C115**	BMPD101-18	Mentoring and Professional Development
16	C116**	BMPD201-18	Mentoring and Professional Development
17	C201	BTME 301-18	Fluid Mechanics
18	C202	BTME-302-18	Theory of Machines -I
19	C203	BTME-303-18	Machine Drawing
20	C204	BTME 304-18	Strength of Materials-I
21	C205	BTEC 305-18	Basic Electronics Engineering
22	C206	BTME-305-18	Basic Thermodynamics
23	C207*	BTME-306-18	Strength of Materials Lab
24	C208*	BTME-307-18	Theory of Machines Lab
25	C209*	BTME-308-18	Fluid Mechanics Lab
26	C210***	BMPD-301-18	Mentoring and Professional Development
27	C211	BTME-401-18	Applied Thermodynamics
28	C212	BTME-402-18	Fluid Machines
29	C213	BTME-403-18	Strength of Materials -II
30	C214	BTME-404-18	Materials Engineering
31	C215	BTME-405-18	Theory of Machines -II

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32	C216**	EVS-101-18	Environmental Science
33	C217*	BTME-406-18	Applied Thermodynamics Lab
34	C218*	BTME-407-18	Fluid Machines Lab
35	C219*	BTME-408-18	Materials Engineering Lab
36	C220***	BMPD-401-18	Mentoring and Professional Development
37	C301	BTME- 501-18	Heat Transfer
38	C302	BTME- 502-18	Design of Machine Elements
39	C303	BTME- 503-18	Manufacturing processes
40	C304	BTME- 504-18	Management and Engineering Economics
41	C305*	BTME- 505-18	Heat Transfer Lab
42	C306*	BTME- 506-18	Manufacturing processes lab
43	C307*	BTME- 507-18	Numerical Methods Lab
44	C308**	BTMC-102-18	Essence of Indian Knowledge Tradition
45	C309*	BTME409-18	Four Weeks Industrial Training
46	C310	BTME 601-18	Refrigeration and Air conditioning
47	C311	BTME 602-18	Mechanical Measurement and Metrology
48	C312	BTME 603-18	Automobile Engineering
49	C313	BTME 604-18	Introduction to Industrial Management
50	C314*	BTME 605-18	Refrigeration and Air Conditioning Lab
51	C315*	BTME 606-18	Mechanical Measurement and Metrology Lab
52	C316*	BTME 607-18	Automobile Engineering Lab
53	C317	BTME 613-18	Computer Aided Design
54	C318	BTME-615-18	Non-Conventional Energy Resources
55	C319*	BTME608-18	Minor Project
56	C401	BTME701-18	Mechanical Vibrations
57	C402	BTME702-18	Automation in Manufacturing
58	C403	BTME703-18	Fundamentals of Management for Engineers
59	C404	BTME704-18	Project-II
60	C405	BTEC-301-18	Electronic devices
61	C406	BTME612-18	Composite Materials
62	C407	BTME614-18	Product Design and Development
63	C408	BTME617-18	Maintenance and Reliability
64	C409*	BTME-801	Software Training and Industrial Training

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Course Outcomes for B.Tech ME

After the completion of this course, students will be able to

Engineering Physics BTPH101-23: C101	
C101.1	relate the origin of bands inside the solids with the help of crystallography.
C101.2	discuss the working, properties and characterization techniques of semiconductor materials and devices.
C101.3	explain the properties of Magnetic materials and Nanomaterials along with its synthesis.
C101.4	develop the knowledge about the Maxwell equation and Electromagnetic spectrum.
C101.5	appraise the need for quantum mechanics, wave particle duality, uncertainty principle etc. and their applications.
C101.6	examine the laser system, optical fibre in industries, laboratories and in communication.
Engineering Physics (Lab) BTPH102-23: C102*	
C102.1	demonstrate some of the theoretical concepts learnt in the theory courses.
C102.2	analyzing and applying precise measurements and handling sensitive equipment.
C102.3	propose the methods used for estimating and dealing with experimental uncertainties and systematic "errors."
C102.4	interpret conclusions from data and develop skills in experimental design.
C102.5	create technical reports which communicate scientific information in a clear and concise manner.
Engineering Mathematics -I BTAM101-23: C103	
C103.1	examine the convergence and divergence of sequences and series.
C103.2	apply the concept of Proper integral to find length, surface area and volume of revolution of the curves and to deal with discontinuous functions using Improper integral.
C103.3	use the concepts of partial differentiation to expand, estimate and find the extreme values of Multivariable functions .
C103.4	evaluate area and volume of the surfaces using the concept of double and triple integration.

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Basic Electrical Engineering BTEE101-18: C104	
C104.1	categorize circuit elements, sources and mathematical analysis of DC circuits
C104.2	analyze the behavior of AC circuits.
C104.3	interpret the basic magnetic circuits and apply it to the working of electrical machines.
C104.4	classify the components of low voltage electrical installations.
Basic Electrical Engineering (Lab) BTEE102-18: C105*	
C105.1	make use of common electrical measuring instruments and interpret the fundamentals of electrical engineering.
C105.2	construct electrical connections and measure power, power factor using appropriate equipment.
C105.3	utilize the knowledge of basic magnetism to understand working of transformers.
C105.4	demonstrate operation of electrical machines, components and their ratings.
Engineering Graphics & Design BTME 101-21: C106	
C106.1	illustrate and prepare drawings.
C106.2	apply the principles of orthographic projections
C106.3	analyze and visualize of two and three dimensional planes and solids respectively.
C106.4	design and fabricate surfaces of different shapes.
C106.5	construct the objects in three dimensional appearances.
Chemistry-I BTCH101-23: C107	
C107.1	interpret concepts related to atomic and molecular structure at orbital level as well as categorize various intermolecular forces.
C107.2	infer about thermodynamic functions, chemical equilibria, water chemistry and corrosion.
C107.3	interpretation of data by using different spectroscopic techniques and its daily life applications.
C107.4	explain and distinguish different periodic properties of elements such as ionization energy, electron affinity, electronegativity, oxidation state and polarizability.

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C107.5	classify major organic chemical reactions used for the synthesis of molecules as well as drugs.
C107.6	Illustrate three dimensional arrangements and isomers possible for a molecule and their properties.
Chemistry-I (Lab) BTCH102-18 : C108*	
C108.1	rephrase interactions among molecules on the basis of surface tension, viscosity and Partition Coefficient.
C108.2	develop Polymer and drug molecule as well as analyze salt samples.
C108.3	estimate rate constants of chemical reactions as a function of time.
C108.4	discover acidity and chloride content present in water sample.
C108.5	evaluate adsorption isotherm and extent of adsorption using TLC
Engineering Mathematics -II BTAM201-23: C109	
C109.1	determine the existence and uniqueness of the solution of system of linear equations using matrix algebra
C109.2	relate the concepts of Basis and Dimension of a vector space in linear transformation.
C109.3	utilize the acquired knowledge of eigen values and eigen vectors to diagonalize the matrix
C109.4	solve ODE using different methods
C109.5	apply the concepts of ODE in RLC circuit, Deflection of beams, Simple harmonic motion, Simple population decay model, Orthogonal trajectories of a given family of curves
C109.6	solve Partial Differential Equations using Lagrange's and Charpit's method
Programming for Problem Solving BTPS101-18: C110	
C110.1	demonstrate the knowledge and working of a computer with its parts.
C110.2	formulate simple algorithms and translate the algorithms to programs (in C language).
C110.3	evaluate conditional branching, iteration statements and recursion process.
C110.4	develop coding using arrays and implement various operations using 1D and 2D array (Matrix arithmetic operations).

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C110.5	interpret the identified problems using functions and implementing searching and sorting algorithms on the given list as well as construct recursive functions.
C110.6	apply programming to design pointers, structures and file handling.
Programming for Problem Solving (Lab) BTPS102-18: C111*	
C111.1	evaluate given algorithms for the development of correct program.
C111.2	identify syntax errors and logical errors at compile and run time for correction.
C111.3	develop iterative as well as recursive programs.
C111.4	formulate data in arrays, strings and structures and manipulate them through a program.
C111.5	create pointers of different types and implement them in defining self-referential structures.
C111.6	design coding to create, read and write to and from simple text files.
Workshop/Manufacturing Practices BTMP101-18: C112*	
C112.1	interpret the different manufacturing processes which are commonly employed in the industry to fabricate components using different materials
C112.2	apply knowledge to construct different jobs with their own hands.
C112.3	interpret the dimensional accuracies and tolerances possible with different manufacturing processes.
C112.4	develop small devices of their interest.
English BTHU101-18: C113	
C113.1	improve their vocabulary to use different words and phrases in formulating meaningful sentences.
C113.2	identify and ascertain knowledge about the basic grammatical aspects and sentence structures for developing effective communication.
C113.3	interpret the given text and employ effective writing techniques for organizing and producing clear and coherent forms of expression.
C113.4	identify and interpret the literal and contextual meaning of the given text to Compose their responses accordingly.
C113.5	apply their point of view effectively for developing and generating their ideas in creative written form.

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C113.6	compose varied forms of business correspondence and professional documents for the purpose of informing, recognizing, analyzing and official reporting.
English (Lab) BTHU102-18: C114*	
C114.1	build their listening and speaking skills by acquiring new forms of expressions for lucid communications.
C114.2	formulate structured conversation and put forth their point of view fluently on a variety of topics.
C114.3	overcome their inhibition and feel confident while demonstrating their language skills to make the transitions clear.
C114.4	interpret, analyze and use correct language in general, academic and professional environment.
C114.5	understand and function as per the expectations of the industry to prepare themselves for future interviews.
C114.6	design presentation on a given topic, learn to modulate their voice along with exhibiting the right body language.
Mentoring & Professional Development MPD101-18: C115**	
C115.1	improve themselves by setting and working towards individual goals.
C115.2	demonstrate the importance of moral & ethical values that exemplify professionalism.
C115.3	develop physical fitness, wellness & sports to promote a healthy lifestyle.
C115.4	construct various analytical & training methods for their development.
C115.5	utilize physical activity as a tool to manage stress, pressure & work in life.
Mentoring & Professional Development MPD201-18: C116**	
C116.1	improve themselves by setting and working towards individual goals.
C116.2	demonstrate the importance of moral & ethical values that exemplify professionalism.
C116.3	develop physical fitness, wellness & sports to promote a healthy lifestyle.
C116.4	construct various analytical & training methods for their development.
C116.5	utilize physical activity as a tool to manage stress, pressure & work in life.

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Fluid Mechanics (BTME301-18) : C201	
C201.1	Identify the behaviour of fluids at rest or in motion and their classifications.
C201.2	Explain the effect of fluid pressure and the stability of the submerged and floating bodies
C201.3	Identify the type of fluid flow and their representation on different coordinate systems and terms such as streamlines, path lines, streak lines, and timelines.
C201.4	Apply the concept and derivation of Bernoulli's equation and its application to measure the flow rate.
C201.5	Discuss the concept of dimensionless numbers and their application in various flow situations.
C201.6	Identify the classification of internal flow through the pipes and determine the losses in pipe flow.

Theory of Machines – I (BTME-302-18): C202	
C202.1	Construct simple mechanisms and analyze their displacement, velocity and acceleration.
C202.2	Design various mechanisms using lower and higher pairs.
C202.3	Propose suitable belts, chains or rope drives for power transmission under various conditions.
C202.4	Construct the cam profiles for a given follower motion by applying engineering principles.
C202.5	Apply the concepts of friction and wear in various friction devices considering the environmental aspects.
C202.6	Design a suitable flywheel and governor for specific requirement of energy and fuel, respectively, for different systems.

Machine Drawing (BTME-303-18) : C203	
C203.1	Apply the principles of drawings to draw and interpret the machine drawings.
C203.2	Construct Various types of temporary and permanent fasteners and their joints.
C203.3	Develop Various types of Couplings, Joints and pipe fittings.
C203.4	Construct orthographic views of a variety of assembled and disassembled IC Engine parts, boiler mountings and other machine parts.
C203.5	Apply the Computer Aided Drafting (CAD) softwares to draw various machine drawings.

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Strength of Materials -I (BTME 304-18) : C204	
C204.1	Determine various stresses and Strains developed in structural members and machine elements due to different simple and complex forces.
C204.2	Analyze the resistance offered by the beams imposed by various types of loads and draw shear force and bending moment diagrams.
C204.3	Estimate the bending stresses induced in the beams of different sections.
C204.4	Analyze the individual and combined effect of torque and bending moment on rotating machine elements.
C204.5	Identify and resolve the instability issues in structural members and machine elements having long compression members in the form of Columns and struts.
C204.6	Apply the appropriate method to determine slope and deflection of various beam sections.

Basics Electronic Engineering (BTEC 305-18): C205	
C205.1	Explain the construction of diodes and their rectifier applications
C205.2	Explain the construction and working bipolar junction transistors and MOSFETs
C205.3	Design Op-Amp IC based fundamental applications.
C205.4	Discuss working of basic elements of digital electronics and circuits

Basic Thermodynamics (BTME 305-18): C206	
C206.1	Define the basic fundamentals of thermodynamics in situations involving heat and work interactions.
C206.2	Demonstrate the first law of thermodynamics and applying its concept to solve flow and non-flow processes.
C206.3	Apply the second law of thermodynamics to solve problems related to refrigerator, heat pump and heat engine.
C206.4	Analyze and evaluate the performance of various gas power cycles.
C206.5	Explain the constructional details along with working of IC engines and their classification.
C206.6	Apply the concept of steam properties to evaluate the performance of gas turbines and IC engines.

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Strength of Materials Lab (BTME-306-18): C207*	
C207*.1	Estimate the mechanical properties of various materials under direct loading.
C207*.2	Select the most suitable hardness testing method to gauge the hardness of given material.
C207*.3	Determine impact strength using Impact test and mechanical properties of materials subjected to torsion.
C207*.4	Find out the endurance limit of materials subjected to cyclic loads.
C207*.5	Evaluate the deflection of beams and columns under transverse and axial loading.
C207*.6	Evaluate the stiffness and modulus of rigidity of helical springs.

Theory of Machines Lab (BTME-307-18): C208*	
C208*.1	Identify and apply the engineering knowledge to categorize various link, kinematic pairs and mechanisms.
C208*.2	Discuss various motorized mechanisms such as, Flywheel, Governor, Gyroscope, Cam Apparatus and Balancing Apparatus.
C208*.3	Propose the most appropriate Belt and Pulley material combination for a particular application.
C208*.4	Construct circumferential and axial pressure profile in a full journal bearing.
C208*.5	Find the velocity ratio of Gear and Gear Trains drives.

Fluid Mechanics Lab (BTME308-18): C209*	
C209*.1	Determine hydrostatic torque on a submerged body.
C209*.2	Estimate the frictional losses in pipes under different conditions.
C209*.3	Analyze the Bernoulli equation and continuity equation and their validation with the help of the experiment.
C209*.4	Explain the working of different flow measuring devices and able to measure the flow rate using them.

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Mentoring & Professional Development (BMPD 301-18): C210*** Year of study:2021-22	
C210***.1	Improve themselves by setting and working towards individual goals.
C210***.2	Demonstrate the importance of moral & ethical values that exemplify professionalism.
C210***.3	Develop physical fitness, wellness & sports to promote a healthy lifestyle.
C210***.4	Construct various analytical & training methods for their development.
C210***.5	Utilize physical activity as a tool to manage stress, pressure & work in life.

Applied Thermodynamics (BTME 401-18): C211	
C211.1	Apply the principles of operation and performance evaluation of reciprocating air compressors.
C211.2	Identify the concept of combustion of fuel and examine the same in Boiler and IC engines
C211.3	Discuss the concept of steam properties and apply the knowledge to solve the problem related to steam nozzles.
C211.4	Analyze and evaluate the working of vapor power cycles under reheating and regenerative conditions
C211.5	Evaluate the performance of steam turbines (Impulse and reaction).
C211.6	Classify various types of condensers and their working and performance evaluation.
Fluid Machines (BTME 402-18): C212	
C212.1	Explain the basic concepts and principles employed in fluid machinery like impulse-momentum principle, jet impingement, and turbomachinery.
C212.2	Apply the principle and working of the Pelton turbine and its various efficiencies.
C212.3	Discuss the principle and working of Francis and Kaplan turbines to calculate the output and their design parameters.
C212.4	Explain the constructional details and understand the working concept of centrifugal pump and able to analyze its performance.
C212.5	Explain the constructional details and working principle of the reciprocating pump and able to evaluate its performance under various conditions.
C212.6	Discuss the constructional details and working of hydraulic devices like fluid

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Strength of Materials-II (BTME 403-18): C213	
C213.1	Examine the resilience exhibited by various elastic members due to different loading conditions
C213.2	Apply the appropriate failure theory to limit the applied load on various mechanical systems.
C213.3	Analyze the forces acting and thereby stresses induced in different types of springs.
C213.4	Evaluate the stresses induced and dimensional changes in thin and thick cylinderical and spherical shells.
C213.5	Determine the behavior of unsymmetrical elastic members under bending and locate shear centre for different sections.
C213.6	Formulate the shear stresses in beams of different sections and centrifugal stresses in discs and Rims.

Materials Engineering (BTME-404-18): C214	
C214.1	Explain the fundamental concept of Crystallography and analyze the structure of metals at different levels.
C214.2	Analyze the Imperfections in solid occurring during various thermal processes.
C214.3	Analyze the concept of phase transformation and basic terminologies associated with metallurgy
C214.4	Discuss the concept of different heat treatment processes and its application.
C214.5	Elaborate the metallurgical properties of ferrous metals and their alloys.
Theory of Machines-II (BTME-405-18)): C215	
C215.1	Explain the static equilibrium of various mechanisms using static force analysis.
C215.2	Analyze dynamic analysis of 3-bar and 4-bar mechanisms.
C215.3	Assess and solve the complex balancing problems for various mechanisms or machines.
C215.4	Demonstrate the gear theory to calculate the torque transmission of different gear trains.
C215.5	Apply the principles of gyroscopic effects and stabilization on various transport vehicles.
C215.6	Design various mechanisms by performing kinematic synthesis for them.

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Environmental Science (EVS-101-18): C216**	
C216**.1	Measure environmental variables and interpret results
C216**.2	Evaluate local, regional and global environmental topics related to resource use and management
C216**.3	Propose solutions to environmental problems related to resource use and management
C216**.4	Interpret the results of scientific studies of environmental problems
C216**.5	Explain threats to global biodiversity, their implications and potential solutions

Applied Thermodynamics lab (BTME 406-18): C217*	
C217*.1	Explain the constructional details along with working of IC engines (2 and 4 Stroke), Boilers (Fire and water tube) and Condensers.
C217*.2	Evaluate the performance of fire tube/water tube boiler.
C217*.3	Determine of dryness fraction of steam to analyze and evaluate the performance of an impulse steam turbine.
C217*.4	Analyze and evaluate the performance of Petrol Engine for a single/multi-cylinder Engines.
C217*.5	Analyze and evaluate the performance of Diesel Engine for a single/multi-cylinder Engines.

Fluid Machines Lab (BTME 407-18): C218*	
C218*.1	Explain the working principle of impulse turbines and measure their characteristics.
C218*.2	Discuss the working principle of reaction turbines and measure their characteristics.
C218*.3	Measure the performance of the centrifugal and reciprocating pumps.
C218*.4	Discuss the working principle of a hydraulic ram measure its efficiency.

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Materials Engineering Lab (BTME-408-18): C219*	
C219*.1	Develop understanding of the various atomic/crystal structure of metals
C219*.2	Explain the effect of heat treatment on various engineering materials by analyzing its microstructure and hardness.
C219*.3	Analyze the microstructure of different ferrous and non-ferrous specimens.
C219*.4	Evaluate the mechanical behaviour of materials.

Mentoring & Professional Development (BMPD 401-18): C220*** Year of study:2021-22	
C220*** .1	Improve themselves by setting and working towards individual goals.
C220*** .2	Demonstrate the importance of moral & ethical values that exemplify professionalism.
C220*** .3	Develop physical fitness, wellness & sports to promote a healthy lifestyle.
C220*** .4	Construct various analytical & training methods for their development.
C220*** .5	Utilize physical activity as a tool to manage stress, pressure & work in life.
Heat Transfer (BTME- 501-18): C301	
C301.1	Explain the basic principles of conduction, radiation, and convection heat transfer
C301.2	Demonstrate an understanding of the concept of conservation of energy and its application to problems involving conduction, radiation, and/or convection heat transfer.
C301.3	Solve engineering problems involving conduction heat transfer.
C301.4	Identify, formulate, and solve engineering problems involving forced convection heat transfer, natural convection heat transfer, and heat exchangers.
C301.5	Formulate and solve engineering problems involving radiation heat transfer among black surfaces and among diffuse gray surfaces.

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Design of Machine Elements (BTME502-18): C302	
C302.1	Recommend the most suitable material and method to design a machine element taking into account various static and dynamic forces to be acting on it.
C302.2	Design the shafts and axles subjected to imposement of torque and/or bending moment on to it.
C302.3	Design and suggest the most suitable belts, chains or rope drives for given power transmission.
C302.4	Design and develop an appropriate gear by predicting their strength and potential failure for different conditions.
C302.5	Design bearings, clutches and brakes for various systems.
C302.6	Design spring as energy restore member for different systems and Design of Joints.
Manufacturing processes (BTME-503-18) : C303	
C303.1	Identify and analyze the casting process, metal forming processes and powder metallurgy processes as per the industrial requirements and applications.
C303.2	Apply the principles of metal cutting processes for the different conventional manufacturing methods employed for making different products
C303.3	Justify the needs of additive manufacturing technology to generate the initially model for producing the final product/tools.
C303.4	Apply the knowledge of different metal joining processes in industries to fabricate engineering products as well as domestic applications.
C303.5	Explain and justify the needs of various unconventional machining methods for difficult to machine advance materials.
C303.6	Design and develop tooling for conventional and non-conventional manufacturing methods for manufacturing industrial products efficiently.
Management and Engineering Economics (BTME-504-18) : C304	
C304.1	Explain the development of management and the role it plays at different levels in an organization.
C304.2	Make use of the process and role of effective planning, organizing and staffing for the development of an organization.
C304.3	Relate the necessity of good leadership, communication and coordination for establishing effective control in an organization
C304.4	Apply the knowledge of engineering economics demand supply and its importance in economics decision making and problem solving.
C304.5	Formulate present worth, annual worth and IRR for different alternatives in economic decision making.
C304.6	Select the procedure involved in estimation of cost for a simple component, product costing and depreciation, its methods.

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Heat Transfer Lab (BTME 505-18) : C305*	
C305*.1	Apply basic principles of heat transfer such as conduction, convection and radiation for conducting experiments.
C305*.2	Make use of experimental setups related to heat transfer phenomena for conducting experiment.
C305*.3	Measure and analyze different heat transfer parameters.
C305*.4	Compare result using finite difference methods to solve simple heat transfer problems.

Manufacturing Processes Lab (BTME 506-18) : C306*	
C306*.1	Determine the clay content, moisture content, hardness, permeability and grain fineness number of moulding sand sample.
C306*.2	Illustrate the welding processes such as oxy-acetylene gas welding, manual arc welding, MIG, TIG and spot and apply their skills to make various joints.
C306*.3	Utilize machine tools such as lathe, shaper and milling machine for machining/cutting various profiles on work pieces.
C306*.4	Apply the practical knowledge of manufacturing processes to produce gears on milling machine.
C306*.5	Explain the constructional features and working of grinding machines, hydraulic press, draw bench, rolling mills, drawing and extrusion equipment.

Numerical Methods Lab (BTME-507-18) :C307*	
C307*.1	Elaborate different implementation modes of numerical methods.
C307*.2	Utilize the numerical methods with the understanding of limitations of these methods for solving problems.
C307*.3	Develop and implement their own computer programs.
C307*.4	Solve problems more accurately and efficiently in low computational time
C307*.5	Solve the problems conveniently which are difficult to deal with manually.

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Essence of Indian Knowledge Tradition (BTMC-102-18): C308**	
C308*.1	Outline the Indian Traditional Knowledge systems connecting society and nature.
C308*.2	Appraise about Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
C308*.3	Influence the students with the concepts of Indian philosophical and linguistic traditions.
C308*.4	Compile the Indian artistic traditions.

Four Weeks Industrial Training (BTME-409-18): C309*	
C309*.1	Outline different professional engineering practices and prepare a technical report based on the industrial/software exposure and project undertaken.
C309*.2	Assess the organizational structure, business strategies, and administrative functions.
C309*.3	Develop industrial etiquette like punctuality and target oriented working.
C309*.4	Appraise the students to handle responsibilities and work pressure effectively.
C309*.5	Develop interpersonal and technical communication skills.
C309*.6	Develop the ability to work as an effective team member/leader.

Refrigeration and Air Conditioning (BTME 601-18): C310	
C310.1	Apply the basic concepts of refrigeration systems.
C310.2	Determine the performance of vapor compression refrigeration system and its components.
C310.3	Explain the properties, applications and environmental issues of different refrigerants.
C310.4	Discuss the basic components of vapor absorption refrigeration systems and their comparison.
C310.5	Make use of psychometry properties and psychometric processes.
C310.6	Evaluate cooling and heating loads in an air conditioning system.

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Mechanical Measurements & Metrology (BTME-602-18): C311	
C311.1	Develop the knowledge of basics of Measurements, Metrology and measuring devices. Selection of measuring instruments, standards of measurement for calibration.
C311.2	Apply the concepts of various measurement systems & standards with regards to realistic applications and principle of various comparators and angular measurement devices for linear & angular measurements.
C311.3	Interpret functional principle of elements like sensors and transducers and apply them for measurement of position/displacement, velocity/ acceleration, force and liquid level.
C311.4	Utilize knowledge and select different temperature measurement techniques devices and to measure temperature in various engineering applications.
C311.5	Make use of the concept and measurement techniques of Internal and External elements for gears, screw threads and methods of evaluation for Surface characteristics and finish using variety of instruments.
C311.6	Select and use appropriate methods and instruments employing Optical Interference and Interferometry.
Automobile Engineering (BTME-603-18): C312	
C312.1	Identify various components of automobiles.
C312.2	Demonstrate the working of different automobile system such as suspension systems, engine, clutch, transmission, ignition system, fuel supply system, steering system and brakes.
C312.3	Demonstrate the working of vehicles run by alternate energy resources.
C312.4	Develop a strong base for understanding vehicle safety systems and future developments in the automobile industry.
C312.5	Examine the cause of breakdown in vehicles and able to plan for preventive maintenance.
Introduction to Industrial Management (BTME-604-18): C313	
C313.1	Apply the basic concepts related to industrial engineering & management.
C313.2	Explain the concept of production system & product design for better control of quality and cost.
C313.3	Demonstrate the roles of plant maintenance for improving the life of plant and machinery.
C313.4	Make use of the various aspects of material management and inventory control for better flow of material in any organization.
C313.5	Justify the significance of benchmarking and the role of customer for improving the product quality.

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Refrigeration and Air Conditioning Lab (BTME-605-18): C314*	
C314*.1	Classify refrigerant compressors, expansion devices used in vapour compression refrigeration system, thermostat with range and differential setting, charging of refrigeration system
C314*.2	Evaluate cycle performance and actual coefficient of performance on ice plant refrigeration test rig.
C314*.3	Conduct and analyze the experimental data of performance of Electrolux Refrigerator.
C314*.4	Conduct the performance of window type room air conditioner and system.
Mechanical Measurement & Metrology Lab (BTME-606-18):C315* Year of study:2021-22	
C315*.1	Demonstrate the use of instruments for Measurements, Metrology and measuring devices for instruments calibration and error measurement.
C315*.2	Apply the concepts of various measurement systems & standards with regards to realistic applications and principle of various comparators and angular measurement devices for linear & angular measurements.
C315*.3	Explain the principle of functional elements like sensors and transducers and apply for measurement of position/displacement, velocity/ acceleration, force and liquid level.
C315*.4	Apply the knowledge of pressure and flow measuring devices to measure pressure and flow
C315*.5	Select different temperature measurement techniques devices and to measure temperature in various engineering applications.
C315*.6	Select and use appropriate methods and instruments for speed, force, and torque and shaft power measurement.

Automobile Engineering Lab (BTME-607-18): C316*	
C316*.1	Identify Construction, working, preventive maintenance, trouble shooting and diagnosis of various Automobile Systems.
C316*.2	Identify the application of engineering principles to automotive sub-systems such as power unit, transmission, suspension, electric, braking, steering and fuel supply systems.
C316*.3	Importance and features of different systems like axle, differential, brakes, steering, suspension, and balancing etc.
C316*.4	Identify Modern technology and safety measures used in Automotive Vehicles

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Computer Aided Design (BTME-613-18): C317	
C317.1	Apply the CAD in Conventional Product life cycle and design.
C317.2	Create the different wireframe and surface primitives using parametric representations and modelling.
C317.3	Create the different solid primitives using the different representation schemes.
C317.4	Apply geometric transformations on the created wireframe, surface and solid models.
C317.5	Utilize the most appropriate modelling technique for CAD based product development

Non-Conventional Energy Resources (BTME-615-18): C318	
C318.1	Classify the conventional and non-conventional energy resources and their impact on environment and the society.
C318.2	Elaborate the design procedure used for solar collectors.
C318.3	Compile the principles of wind energy conversion system
C318.4	Adapt the fundamental knowledge of biogas conversion, geothermal and tidal energy systems for practical usage.

Minor Project (BTME-608-18): C319*	
C319*.1	Organize the process of doing literatures survey, industrial visit to identifying the problem
C319*.2	Develop the process of problem solving in the group
C319*.3	Apply the basic engineering knowledge and fundamental concepts in the domain of practical applications
C319*.4	Summarize the process of research and able to write a technical document/report

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Mechanical Vibrations (BTME-701-18): C401	
C401.1	Formulate mathematical models of problems in vibrations using Newton's second law or energy principles
C401.2	Evaluate the natural frequency of given single degree of freedom, free undamped or damped vibratory system to avoid resonance condition and determine various parameters to design different types of dampers.
C401.3	Assess the functionality of vibration measuring instruments and design and suggest a suitable vibration absorber for given system subjected to different boundary conditions.
C401.4	Determine the natural frequencies and modes shapes for a given multi degrees of freedom vibratory system.
C401.5	Analyze the vibratory motion of the continuous systems of uniform cross section bearing homogeneous and isotropic properties.
Automation in Manufacturing(BTME-702-18): C402	
C402.1	Design and implement automated systems using pneumatics in industrial environment.
C402.2	Assess the automation system and choose the various elements such as sensor, drives, microprocessor or micro controllers for data acquisition
C402.3	Develop automated systems and electrical drives for the various industrial applications.
C402.4	Propose hydraulic solutions for automated systems.
C402.5	Create basic NC/ CNC part programming for automated manufacturing system.
Fundamentals of Managements for Engineers (BTME703-18):C403	
C403.1	Make use of the various concepts of management and develop managerial skills for growth in their professional career.
C403.2	Classify different quality tools used in the industries for enhancing the product quality.
C403.3	Examine management functions like marketing, supply chain management for better flow of materials.
C403.4	Develop skills to understand the complexities associated with time and motion study management in the organizations and integrate the learning in handling these complexities.
C403.5	Identify the methods to improve productivity and understand the significance of value engineering.
C403.6	Demonstrate the roles, skills and functions of management for the benefits of employees.

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Project-II (BTME-704-18): C404	
C404.1	Organize the process of doing literatures survey, industrial visit to identifying the problem
C404.2	Develop the process of problem solving in the group
C404.3	Apply the basic engineering knowledge and fundamental concepts in the domain of practical applications
C404.4	Summarize the process of research and able to write a technical document/report
Electronics Devices (BTEC-301-18): C405	
C405.1	Interpret the physics of semiconductors and behavior of charge carriers with in semiconductors.
C405.2	Assess the working of semiconductor diodes supported with mathematical explanation.
C405.3	Make use of BJT and MOSFET with their equivalent small signal models.
C405.4	Interpret the chemical processes used in fabrication of integrated circuits.

Composite Materials (BTME-612-18): C406	
C406.1	Interpret the concept, need and applications of composite materials.
C406.2	Select optimum combination of Matrix/Reinforcement of composites for various engineering applications.
C406.3	Identify the crystallographic nature of the interface and the associated tests for measuring the interactions at the interface.
C406.4	Discuss the processing, properties, applications and recycling of Polymer Matrix Composites and Metal Matrix Composites
C406.5	Explain the fabrication techniques and applications of Ceramic Matrix Composites and Carbon Fibre composites
C406.6	Identify the types, processing and structure of multi filamentary superconducting composites for various engineering applications

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Product Design and Development(BTME-614-18): C407	
C407.1	Outline the desirable product design aspects and process capability.
C407.2	Develop product strategy and relate it to the industrial environment.
C407.3	Choose the design and relate it to industrial production environment.
C407.4	Plan the product design keeping in mind the various economic factors.
C407.5	Apply the modern approaches to product design considering concurrent design, quality function deployment and various rapid prototyping methods.
Maintenance and Reliability (BTME-617-18): C408	
C408.1	Interpret the basic Concepts of Maintenance and Reliability.
C408.2	Estimate the Cost Aspects of Maintenance and Planning of Maintenance Activities.
C408.3	Identify the applications of Reliability and Maintenance Engineering for different systems.
C408.4	Examine the concept of Availability of Engineering systems and Reliability Improvement.
C408.5	Construct and analyze the fault tree to calculate reliability.

Software and Industrial Training (BTME-801): C409*	
C409*.1	Outline different professional engineering practices and prepare a technical report based on the industrial/software exposure and project undertaken.
C409*.2	Assess the organizational structure, business strategies, and administrative functions.
C409*.3	Develop industrial etiquette like punctuality and target oriented working.
C409*.4	Appraise the students to handle responsibilities and work pressure effectively.
C409*.5	Develop interpersonal and technical communication skills.
C409*.6	Develop the ability to work as an effective team member/leader.

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List of Subjects for M.Tech. ME

Sr. No.	Course Code	PTU code	Subject Name
1	C101	MTME-101	Advanced Engineering Materials
2	C102	MTME-102	Finite Element Analysis
3	C103	MTME-103	Advanced Design of Mechanical Systems
4	C104	MTME-104	Operations Management
5	C105	MTME-105	Advanced Thermodynamics
6	C106	MTME-201	Research Methodology
7	C107	MTME-202	Tribology
8	C108	MTME-203	Modern Manufacturing Processes
9	C109	MTME-204	Computational Fluid Dynamics
10	C110	MTME-212	Supply Chain Management
11	C111	MTME-213	Product Design and Development
12	C112	MTME-221	Composite Materials
13	C201	MTME-211	Maintenance and Reliability Engineering
14	C202	MTME-206	Automation and Robotics
15	C203	MTME-222	Instrumentation and Control Engineering
16	C204	MTME-216	Mechatronics
17	C205	MTME-301	Project
18	C206	MTME-302	Seminar
19	C207	MTME-401	Dissertation

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Course Outcomes (COs) for M.Tech. ME

Advanced Engineering Materials (MTME-101): C101	
C101.1	Make use of the various properties of engineering materials.
C101.2	Identify the basic properties and characteristics of composite materials.
C101.3	Examine the basic properties of Ceramics and Glasses.
C101.4	Utilize the basic aspects of low and high temperature advanced materials and their applications.
C101.5	Assess the basic properties, applications and developments of various smart materials.
C101.6	Analyze the basic aspects of nanomaterial and their applications, physical and mechanical properties.

Finite Element Analysis (MTME-102): C102	
C102.1	Identify the basic concepts of Finite Element methods and its applications to complex engineering problems
C102.2	Analyze the characteristics and selection of different finite elements used in finite element methods
C102.3	Solve the equilibrium equations and stress-strain relations for different boundary conditions encountered in structural, fluid and heat transfer problems
C102.4	Solve the basic problem related to structural, fluid and heat transfer problems

Advanced Design of Mechanical Systems (MTME- 103): C103	
C103.1	Interpret the product design, its objectives and constraints.
C103.2	Apply the concepts of CAD, CAM and CAE and understand the management of industrial design process.
C103.3	Classify different types of materials and their selection criteria, working principle and design possibilities.
C103.4	Examine the component design and design principles for manufacturability.
C103.5	Interpret various assembly processes and guidelines for Assembly designs.
C103.6	Make use of concept of design for minimizing the environmental issues, global issues, regional and local issues.

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Operations Management (MTME-104): C104	
C104.1	Examine ever growing importance of Operations management in any business environment/set up.
C104.2	Develop in-depth understanding of resource utilization of an organization.
C104.3	Identify the challenges faced by firm's service and manufacturing industry.
C104.4	Determine the various aspects of functional management.
C104.5	Develop skills to operate competitively in any business scenario.
C104.6	Make use of the concepts of inventory and purchasing management

Advanced Thermodynamics (MTME-105): C105	
C105.1	Analyze the availability and thermodynamic property relations
C105.2	Analyze the chemical thermodynamics and equilibrium.
C105.3	Solve the problems based on second law analysis of Power cycles.
C105.4	Analyze the thermodynamics of Irreversible Processes.
C105.5	Make use of the concept of thermoelectric energy conversion devices.

Research Methodology (MTME-201): C106	
C106.1	Identify the nature and objective of research and review process.
C106.2	Classify and apply sampling techniques using statistical tools.
C106.3	Apply various plagiarism tools and understand different statistical tools.
C106.4	Design experiment by using Taguchi method and ANOVA.
C106.5	Analyze response surface method to process optimization.

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Tribology (MTME-202): C107	
C107.1	Identify the basic concepts of tribology, types of contacts, motion and deformations.
C107.2	Interpret the friction and wear theories, laws, types and characteristics.
C107.3	Examine the importance, types and mechanism of lubrication.
C107.4	Make use of the basic concepts of tribology of bearings and industrial applications of tribology.

Modern Manufacturing Process (MTME-203): C108	
C108.1	Distinguish between conventional and non-conventional metal cutting processes.
C108.2	Apply the principles of mechanics and concept of metal cutting process based on the mechanical energy.
C108.3	Apply the knowledge of thermos-electric energy for the machining of advanced electrically conductive materials.
C108.4	Analyze the Electrochemical and Chemical Machining Processes for the modern materials.
C108.5	Make use of powder metallurgy technique for producing the products.
C108.6	Apply basic principles of special manufacturing processes like physical vapor deposition, chemical vapour deposition, thermal metal spraying and Additive manufacturing such as 3-D printing

Computational Fluid Dynamics (MTME-204): C109	
C109.1	Illustrate the basics of computational fluid dynamics.
C109.2	Solve the problems based on basic flow governing equations.
C109.3	Apply the concept of PDEs to solve numerical problems.
C109.4	Model the engineering problem using the Finite Difference Method.
C109.5	Model the engineering problem using the Finite Volume Method.
C109.6	Utilize numerical modelling of turbulent and incompressible viscous flow for problem solving.

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Supply Chain Management (MTME-212): C110	
C110.1	Interpret the fundamental concept of supply chain management and analyze supply chain performance.
C110.2	Elaborate the concept of economy in logistics and supply chain management.
C110.3	Analyze the logistic, its related costs and performance.
C110.4	Explain the concept of benchmarking and coordination in supply chain.

Product Design and Development (MTME-213): C111	
C111.1	Identify desirable design aspects considering various production processes and also understand the economic factors of design.
C111.2	Make use of engineering, scientific, and mathematical principles to execute a design from concept to finished product.
C111.3	Apply the modern approaches to product design considering concurrent design, quality function deployment and various rapid prototyping methods.
C111.4	Apply innovative process techniques in synthesizing information, problem-solving and critical thinking.

Composite Materials (MTME-221): C112	
C112.1	Identify the concept, classification, need and various related aspects of composite materials.
C112.2	Select optimum combination of Matrix/Reinforcement for various engineering applications.
C112.3	Make use of the aspects of matrix materials and its properties.
C112.4	Interpret the various processing techniques, properties and applications of composites.

Maintenance and Reliability Engineering (MTME-211):C201	
C201.1	Design transition programs to implement maintenance strategies according to system characteristics
C201.2	Develop ability in formulating suitable maintenance strategies to enhance system reliability of a manufacturing system.
C201.3	Formulate reliability strategies keeping in mind MTTF and MTTR strategies.
C201.4	Develop ability to understand reliability design and its applications.

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Automation and Robotics (MTME-206):C202	
C202.1	Interpret the Automation production system, Mechanization & Automation Types of automation and Economics of automation.
C202.2	Summarize manufacturing automation, classification and type of automatic transfer machines and assembly types.
C202.3	Identify the classification, principles and applications of robot technology.
C202.4	Choose precise and accurate production support machines and systems.

Instrumentation and Control Engineering (MTME-222):C203	
C203.1	Propose the most suitable measuring instrument for a specific application.
C203.2	Apply the principles of Instrumentation for Generation and Analysis of Waveforms and understand the concepts of control systems.
C203.3	Identify the time and frequency domain analysis for a given system.
C203.4	Apply specific control component, as per the requirement of systems.

Mechatronics (MTME-216):C204	
C204.1	Identify key elements of mechatronics system and its representation in terms of block diagram.
C204.2	Classify various Fluid power control elements.
C204.3	Interpret various Sensors and Transducers and proper selection of Sensors.
C204.4	Analyze time and frequency domain of system model for control application.
C204.5	Identify the various applications of mechatronics in manufacturing and automation

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Project (MTME-301):C205	
C205.1	Make use of the basic concepts & broad principles of Industrial projects.
C205.2	Interpret the concepts of Project and Production Management.
C205.3	Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach.
C205.4	Demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context.

Seminar (MTME-302):C206	
C206.1	Develop interest towards research oriented field with ability to search the literature and brief report preparation.
C206.2	Develop the skills, competencies and points of view needed by professionals in the field most closely related to the course.
C206.3	Interpret advanced technology and research in engineering.
C206.4	Develop technical writing skills.
C206.5	Develop presentation skills.

Dissertation (MTME-401):C207	
C207.1	Apply in-depth knowledge of the major subject/field of study, including deeper insight into current research and development work.
C207.2	Apply deeper knowledge of methods in the major subject/field of study.
C207.3	Develop the capability to contribute to research and development work.
C207.4	Develop capability to use a holistic view to critically, independently and creatively identify, formulate and deal with complex issues.
C207.5	Develop capability to plan and use adequate methods to conduct qualified tasks in given frameworks and to evaluate this work.

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